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MOLLUSKS
OF THE
ATLANTIC COAST

AUSTIN C. APGAR

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MOLLUSKS

OF THE

ATLANTIC COAST

OF THE

UNITED STATES,

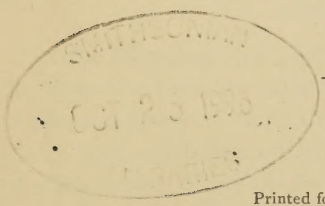
SOUTH TO

CAPE HATTERAS,

BY

AUSTIN C. APGAR,

PROFESSOR OF ZOOLOGY IN THE NEW JERSEY STATE NORMAL SCHOOL.



Printed for the Author by
LUCAS & CO., TRENTON, N. J.

JOURNAL

OF THE

NEW JERSEY NATURAL HISTORY SOCIETY.

Vol. II. JANUARY, 1891. No. 2.

MOLLUSKS OF THE ATLANTIC COAST OF THE UNITED STATES SOUTH TO CAPE HATTERAS.

AUSTIN C. APGAR.

In the following Key and descriptions of Mollusks, the object in view has been to enable students to become familiar with molluscan forms in the same way that men learn to know the plants and vertebrates of the land; by such agencies as the Keys of Gray's, and Wood's Botanies, and Jordan's, and Coues' works on Vertebrates. The most artificial Keys are the most successful with beginners. In this Key, accordingly, no great attempt has been made to follow any advanced classification by referring to the anatomical parts upon which such a classification is based.

Any determination by a Key necessarily forces the student to make a deeper investigation of parts than does any other method. As a general thing, too, such investigation is made by the student while the animal is still living, and the mere fact of its being alive adds greater zest and interest to his work. As far as I know all works yet published upon the shells of the region depend almost if not entirely upon engravings of all the species for their determination; and those acquainted with shells have become so either by means of these engravings, by seeing the shells in collections, or by pestering and questioning those who know more than they do. This tends to make students mere shell collectors, who are entirely satisfied if only they can call their specimens by name.

In writing this paper, my hope has been to interest our shore dwellers and shore visitors in the habits and life history of our shell fish. The only originality claimed for the work is the Key. The classification, except of the Sea Slugs and Squids, is that of Wm. H. Dall, A. M., Curator Department of Mollusks, U. S. National Museum, in Bulletin No. 37. The descriptions were taken and adapted from all the sources at my command.

Deep sea and pelagic forms are excluded, except those whose shells are occasionally thrown upon the beach after storms.

This is only a preliminary manual and of necessity must contain numerous errors that will be gladly corrected by the author if brought to his attention.

All the measurements given in the Keys and the descriptions are in millimeters (25 to an inch). At the end of the descriptions L. stands for length, H. for height, W. for width, D. for diameter, An. for angle, Ap. for aperture and U. for umbo. The fraction after Ap. gives the relative length of the aperture. Thus Ap. $\frac{1}{3}$ indicates that the aperture is one third the length of the shell. The fraction after U. states the position of the umbo. Thus U. $\frac{1}{4}$ indicates that the distance of the umbo from the *anterior end* is one-fourth the whole length of the shell. The application of these terms to bivalve shells is shown on Plate II., to univalve shells on Plate III. Plate IV. contains a protractor and millimeter measurements in a convenient form for use with shells. Apply the shell directly to the plate and the length, width, position of umbo, angle of spire, etc., can be seen.

MOLLUSKS OF THE ATLANTIC COAST SOUTH TO CAPE HATTERAS.

I. Class Pelecypoda. (Bivalves, Lamellibranchiata.) Mollusks with a bivalve shell. The two parts of the shell are somewhat similar in size, shape and material, and are usually joined together by a hinge. See Plate II. and Key below.

II. Class Gastropoda. (Univalves.) Mollusks having either a broad, creeping disk called a foot on which it crawls, or two wing-like expansions from the head by which it swims freely in the water. See Plate III. Figures 21–55 and Key on page 80.

III. Class Cephalopoda. (Squids, Devilfish, etc.) Free swimming, oceanic mollusks with a large, well separated head, having a circle of long, muscular arms around the mouth. Eyes very large and perfect. Usually having no external shell. See Plate III. Figures 56–66 and Key on page 84.

KEY TO THE FAMILIES OF MARINE PELECYPODS.

* Shell when closed at the ventral side, gaping more or less at the ends, some gap a little at one end, most gap at both ends. (N.)

* Shell not at all gaping. (A.)

A. With not over three cardinal teeth in each valve. (C.)

A. With many small cardinal teeth in each valve. (B.)

B. With distinct radiating ribs; large, over 30 long.....*5. Arcidæ*

B. Smooth, and the height and length about equal; under 12 long.....*6. Nuculidæ.*

B. Elongated shells, the length nearly or quite twice the height; a pallial sinus.....7. *Ledidæ.*

C. Valves equal in size, curvature and markings. (F.)

C. Valves unequal, or twisted so as to make them slightly so. (D.)

D. Two muscular impressions; a distinct pallial sinus. (Q.)

D. One muscular impression; height about equal to or greater than the length. (E.)

E. Fixed mollusks with large, thick, rough shells, attached by the larger valve to other shells, etc.....*1. Ostreidæ.*

E. Fixed mollusks with thin, pearly, small shells, fixed by the smaller valve which is flat or concave and has a hole or notch at the hinge for a plug.....*2. Anomiidæ.*

E Free mollusks: hinge line straight, formed by ears at the sides of the umbo; usually with very distinct radiating ribs.....*3. Pectinidæ.*

F. The two muscular impressions very different in size and shape; generally elongated shells, usually twice as long as high; mussel-shaped, the umbo very near or at the anterior end; inner layer usually quite pearly; no pallial sinus; hinge with a few small teeth or none.....*4. Mytilidæ.*

F. Some Pectens have valves so nearly equal that they might be looked for here. (See third E above.)

F. Neither mussel nor Pecten shaped. (G.)

G. Height and length nearly equal; a decided pallial sinus; with either a plain lunule or else a shell under 8 long.....*16. Veneridæ*

G. Height and length nearly equal; no distinct pallial sinus, at the greatest the pallial line is slightly undulated at the posterior end. (J.)

G. Length decidedly greater than the height. (H.)

H. Minute, under 3 long; no sinus.....*11. Erycinidæ.*

H. Pallial sinus distinct; internal cartilage in deep pits.....*22. Paphiidæ.*

H. Pallial sinus large; external ligament present, in most cases on the shorter end of the shell; no internal cartilage. (I.)

I. Triangular wedge-shaped, about twice as long as high; surface with both concentric and radiating striæ; our species about 11 long and thick for its size; crenulated within.....*18. Donacidæ.*

I. Length to the height about as 3 to 2.....*20. Tellinidæ.*

J. With a plain lunule in front of the umbones. (L.)

J. With no lunule ~~and no concentric ridges~~. (K.)

K. With either very distinct radiating ribs or else an almost globular shell under 30 long.....*14. Cardiidæ.*

K. Shell large, strong, with a thick dark epidermis; cardinal teeth three in each valve.....*15. Veniliidæ.*

L. Shell with distinct radiating ribs.....*8. Carditidæ.*

L. Without prominent radiating ribs. (M.)

M. Over 20 long; compressed, thick, smooth or concentrically furrowed; ligament external; epidermis dark and thick.....*9. Astartidæ.*

M. Shell globular, with strong gonial folds; ligament in a groove; no distinct cardinal teeth.....*12. Ungulinidæ.*

M. Shell orbicular, regularly curved, with either laminated concentric ridges or oblique parallel ridges which form an angle at the centre;

ligament oblique, semi-internal; epidermis not thick....*13. Lucinidæ.*

M. Shell somewhat quadrant shaped; small, less than 8 long; surface with concentric ridges.....*10. Crassatellidæ.*

M. Shell not over 5 long, very much compressed; ends rounded.....
.....*11. Erycinidæ.*

N. Without toothed hinge or proper ligament, often with accessory valves; no distinct epidermis. (J.)

N. With proper hinge, often distinctly toothed and with either external ligament or internal cartilage, sometimes both. (O.)

O. Hinge with many small cardinal teeth in each valve.....7. *Ledidæ.*

O. Hinge of not over 4 cardinal teeth in each valve. (P.)

P. Elongated equivalve shells two or more times as long as high, gaping more or less at both ends. (S.)

P. Equivalve shells not fully twice as long as high. (R.)

P. Inequivalve shells; length and height about equal.....*21. Semelidæ.*

P. Inequivalve shells; decidedly longer but not twice as long as high. (Q.)

Q. Over 25 long, thin; right valve much more convex than the left; umbones about central; both external ligament and internal cartilage.
.....*25. Anatinidæ.*

Q. Over 25 long; right valve nearly flat; whole shell so compressed that the width is not over one-sixth the length.....*27. Pandoridæ.*

Q. Over 50 long; slightly inequivalve; no external ligament; an internal cartilage placed between a spoon-shaped process, projecting out of the left valve into a concavity under the umbo of the right valve.
.....*30. Myidæ.*

Q. Not over 12 long, thick, gaping in front; umbones about central.....
.....*29. Corbulidæ.*

Q. Covered with radiating wrinkles, thin, fragile, pearly translucent: left valve slightly larger.....*26. Lyonsiidæ.*

Q. Other small shells not over 18 long.....*20. Tellinidæ.*

R. Shell somewhat triangular-shaped, with an internal cartilage between deep triangular pits, similar in each valve.....*24. Mactridæ.*

R. Shell thin, rounded in front, narrowed and gaping behind; cartilage pit shallow; external ligament short.....*21. Semelidæ.*

R. Shell with a large external ligament; pallial line a series of elongated pits.....*31. Saxicavidæ.*

S. Shells elongated 3–6 times as long as high; epidermis polished; umbones not over one fourth from the anterior end; ligament external.
.....*23. Solenidæ.*

S. Shells about 3 times as long as high; umbones about central.....
....*19. Psammobiidæ.*

S. Shells not 3 times as long as high; surface covered with elevated radiating ridges; chalky white; umbones near anterior end..*17. Petricolidæ.*

S. Shell about twice as long as high; epidermis polished and with a notched border extending beyond the edge of the thin shell.....
.....*28. Solemyidæ.*

S. Shell thick with a thick black epidermis; external ligament prominent and on the shorter end of the shell.....*31. Saxicavidæ.*

T. Length decidedly greater than height.....*32. Pholadidæ.*

T. Length and height nearly equal; small shells usually about 6 long never over 12 long.....*33. Teredidæ.*

KEY TO THE MARINE GASTROPODS.

* Shell spiral, of one to many whorls. (H.)

* Shell of one piece, flat, boat or cup-shaped, if somewhat spiral not forming a complete whorl. (W.)

* Shell straight or slightly curved, globular to tubular needle-shaped. (B.)

* Shell oval-oblong, composed of 8 similar arched pieces or valves, overlapping each other; the margins leather-like. (Y.)

* Animal without any external or internal shell. (A.)

A. Free swimming, pelagic animals with two wing-like projections from the sides of the head.....*36. Clionidæ.*

A. Creeping animals with a broad disk called a foot. (Sea Slugs.) (C.)

B. Shell transparent or nearly so, closed at the posterior end which is quite sharp pointed; animals with wing-like projections; free swimming.....
.....*35. Cavoliniidæ.*

B. Shell tubular, open at both ends; deep water. Genera Dentalium and Cadulus in Dentalidæ.

B. Shell not translucent; tubular, operculated, curved, closed but blunt at the posterior end; our species not over 3 long.....*61. Cæcidæ.*

C. Animal either without gills or the gills concealed on the right side between the mantle and the foot. (G.)

C. Animal with exposed gills on the back. (D.)

D. Gills either pinnate or bipinnate, forming a crown upon the back. (F.)

D. Gills simple to branching tree like, situated more or less along the sides of the body. (E.)

E. Dorsal tentacles retractile into sheaths..... ..... *45. Tritoniidæ.*

E. Dorsal tentacles not retractile into sheaths; some are without tentacles. .....*46. Ælidæ.*

F. Gills non-retractile, forming only a half circle of few plumes..... .....*44. Polyceridæ.*

F. Gills either retractile into one or more cavities or united by a web at base; they form a complete circle or star.....*43. Doridida.*

G. Broad oval in form; ⅔ as wide as long.....*42. Doridellidæ.*

G. Elongated, body itself narrow, some specimens seemingly broad when swimming by the spreading of wing-like expansions on the sides..... .....*47. Elysiidæ.*

H. Shell with the whorls regularly in a single plane and not touching each other;.....no spire See Fig 57.....*71. Spirulidæ.*

H. Dextral or right handed shells. (J.)

H. Sinistral; the whorls in contact. (I.)

I. Shell ovate-globose, small, not over 5 long, transparent...*34. Limacinidæ.*

I. Shell elongated, turreted, slender, less than 30 long.....*58. Triforidæ.*

I. Shell large, over 100 long, with a produced anterior canal..... .....*51. Fasciolariidæ.*

J. Operculated (nearly all marine univalves are operculated); aperture not over one-half the area of the shell, usually much less than one-half. (N.)

J. Non-operculated, or operculum very minute; aperture with neither a canal nor notch at the anterior end. (K.)

J. Non-operculated; aperture with a canal at the anterior end....One species less than 2.0 long. .....*50. Pleurotomidæ.*

K. Aperture over ¾ the area and ¾ the length of the shell; spire distinct, pointed; shell ear shaped.....*67. Naticidæ.*

K. Aperture ½ the area or more and the full length of the shell. (M.)

K. Aperture less than ½ the area of the shell. (L.)

L. Aperture ¾ to the full length of the shell; spire distinct, in most cases flattened; inner lip with a single fold or smooth.. .....*38. Tornatinidæ.*

L. Aperture about ½ the length of the shell; shell globose, thin, fragile, translucent; outer lip very thin; 20–25 long and wide. Shells of Janthina fragilis in Janthinidæ. Rarely thrown on the beach.

L. Deep water species with the inner lip with no teeth but a strong fold; aperture about ½ the length of the shell; spire conical; whole shell many whorled and spirally grooved with, in most cases, punctate striæ; 12 or less long.....*37. Actæonidæ.*

L. Aperture ½–¾ the length of the shell; inner lip with 2 or more teeth.... .....*48. Auriculidæ.*

M. Shell of but a single whorl; aperture more than $\frac{2}{3}$ the area of the shell; minute, less than 2 long.....*41. Philinidæ.*

M. Shell of several whorls, under 4 long; spire flat..... *39. Scaphandridæ.*

M. Shell of several whorls; a pit in place of the spire; over 6 long.....
.....*40. Bullidæ.*

N. Anterior margin of aperture entire, usually rounded. (S.)

N. Anterior margin of aperture notched or produced into a canal. (O.)

O. Shell with a canal formed by a decided prolongation of the anterior end. (V.)

O. Canal short or none, but the aperture notched. (P.)

P. Shell large, 40 or more long; whorls rounded.....*52. Buccinidæ.*

P. Shells 20–40 long; whorls rounded.....*55. Muricidæ.*

P. Whorls flattened and in most species covered with a beaded surface formed by longitudinal and revolving lines or else revolving lines very distinct. (Q.)

Q. Aperture over $\frac{1}{2}$ the length of the shell; angle of spire over 40°. Shell 10–30 long..... .....*53. Nassidæ.*

Q. Aperture $\frac{1}{2}$ or less the length of the shell. (R.)

R. Rather long shells (15–70), angle of spire under 20°....*49. Terebridæ.*

R. Shells less than 15 long; aperture about $\frac{1}{6}$ the length, whorls 9 or more.....*59. Cerithiopsidæ.*

R. Shells less than 10 long; aperture about $\frac{1}{4}$ the length; whorls under 9.
.....*60. Cerithiidæ.*

S. Shell tubular, spiral at the apex, irregularly twisted near the aperture.
.....*62. Vermetidæ.*

S. Shell regularly spiral; elongated, width less than $\frac{1}{2}$ the length; whorls 5 or more; angle of spire less than 45°; aperture less than half the length of the shell. (T.)

S. Shell regularly spiral; shortened; width nearly as great as or greater than the length; whorls usually few; angle of spire always over 50° usually over 90°; aperture over $\frac{1}{2}$ the length of the shell. (U.)

T. Whorls rounded, almost separated, crossed by elevated longitudinal ribs; aperture oval; lip continuous; our species over 10 long.....
.....*56. Scalaridæ.*

T. Whorls about 5; minute shells, less than 5 long; width about $\frac{1}{2}$ length; aperture about $\frac{1}{3}$ length; apex blunt.....*64. Rissoidæ.*

T. Whorls 5–10; shells elongated-conical, turreted; aperture $\frac{1}{4}$-$\frac{1}{3}$; our species 4–10 long.....*57. Pyramidellidæ.*

U. Shell conical; pearly under the epidermis and within the aperture.

usually brilliantly so; under 15 long; aperture circular; whorls convex; umbilicus large and deep.....*69. Trochidæ.*

U. Shell globular or oval; spire quite short; the body whorl very large; umbilicus rounded, distinct, either free or covered with a callus; aperture $\frac{2}{3}$ or more the length of the shell; angle of spire 90° or more.....*67. Naticidæ.*

U. Shell usually top-shaped, sometimes globular; interior not pearly, 8–30 long; umbilicus if present not rounded nor covered with a callus.....*63. Litorinidæ.*

U. Shell minute, nearly disk-shaped, widely umbilicated.....*65. Adeorbidæ.*

V. Large heavy shells, over 100 long, pear-shaped; whorls angulated or nodulous.....*51. Fasciolariidæ.*

V. Rather thin shells, 20–80 long, ovate to pear-shaped; whorls rounded and covered with 40–60 small revolving ridges.....*52. Buccinidæ.*

V. Shells over 20 long, with longitudinal rib-like undulations crossed by revolving lines; in one species the revolving ridges are more distinct than the longitudinal ones.....*55. Muricidæ.*

V. Shells less than 20 long; aperture with a notch near the posterior end formed by the outer lip not squarely meeting the body wall; whorls shouldered and longitudinally ribbed.....*50. Pleurotomidæ.*

V. Shells less than 15 long; aperture entire at the posterior end, narrow and a little less than half the length of the shell; canal rather short.....*54. Columbellidæ.*

W. Shell with the apex somewhat spiral, and an internal, usually horizontal, partition or diaphragm.....*66. Calyptræidæ.*

W. Shell conical or cup-shaped with apex turned forward; no shelf nor partition. (X.)

X. No perforation at the apex nor notch in the margin.....*68. Acmæidæ.*

X. Apex recurved; margin or apex perforated; shells found either in deep water or south of C. Hatteras.....*Fissurellidæ.*

Y. The only species in the region, belonging to the order, are in the family.....*70. Ischnochitonidæ.*

KEY TO THE CEPHALOPODS.

* Body short, rounded behind, with minute terminal fins; having within a white, pearly, spiral, many-chambered shell. Pelagic.....*71. Spirulidæ.*

* Body elongated; eyes covered by the skin of the body; an internal horny part in the back, shaped like a feather; frequently found near shores.....
.....*76. Loliginidæ.*

* Body elongated; eyes naked; the internal horny part in the back never feather-shaped, usually small, lance-form. (**A.**)

A. Fins on the back, not extending to the tail, rounded, narrow at base...
.....*75. Sepiolidæ.*

A. Fins extending to the extremity of the body. (**B.**)

B. Body attenuated behind; fins rounded; tentacular arms long.....
.....*74. Cranchiidæ.*

B. Body not especially slender behind; fins usually triangular. (**C.**)

C. Tentacular arms short and furnished with suckers only.....
.....*72. Ommatostrephidæ.*

C. Tentacular arms with thick clubs furnished with hooks as well as suckers.....*73. Onychoteuthidæ.*

CLASS I. PELECYPODA.

Laterally compressed, headless Mollusks encased in a bivalve shell. Their organs are inclosed in a mantle, one leaf of which envelops each side. Just within the mantle there are in most cases four, leaf-like, striated gills, two on each side. The shell consists of a right and left valve, with more or less of a dorsal hinge, opened by means of a self-acting, elastic substance, and closed by either one or two muscles which extend between the valves. The sexes are usually separate.

Order PRIONODESMACEA.

Hinge teeth almost entirely transverse to the hinge margin, rarely few, often numerous; substance of the shell often in great part pearly; very few are entirely limy or porcellanous.

Family 1. OSTREIDÆ.

Shell inequivalve, slightly inequilateral, free or adherent, resting on one valve; umbo central, not oblique; ligament internal; epidermis thin; adductor impression single in the adult, behind the centre; pallial line obscure; hinge usually without teeth. Animal marine; mantle fully open, slightly adherent to the edge of the shell; foot small or absent; gills crescent shaped, two on each side.

1. Ostrea, L. *The Oysters.*

Shell attached by the left valve; the upper valve flat or concave, often plain; lower convex, often plaited or foliaceous, and with a prominent umbo; cartilage pit elongated; hinge toothless; substance somewhat pearly, laminated.

1. *Ostrea Virginica*, Gmel. Shell gradually widening from the long, pointed umbo; surface, when not worn, showing leaf like scales; muscular impression large, distinct, and near the centre. Surface leaden color; shell whitish; muscular impression chestnut or violet color. Distance from umbo, 150–250; L. 70–80.—Whole coast. Abundant.

Family 2. ANOMIIDÆ.

Shell thin, pearly, with a deep notch or hole in the under valve near the umbones, for a byssal plug by which the shell is attached.

Animal without palpi around the mouth; mantle open except

at the hinge, with the double margins pendent and fringed but with no ocelli; gills two on each side, unsymmetrical, united posteriorly; foot small, cylindrical, expanded and grooved at the end; byssus large, scaly, passing through a hole in the mantle and attached by a powerful muscle to the left valve.

1. Anomia, L.

Shell suborbicular, thin, pearly, translucent, with a deep notch or hole in the right valve for a plug which is used to fasten the shell to other shells; this lower valve is flat or concave. Animal with open mantle and small, cylindrical foot.

1. *Anomia simplex*, Orb. (Fig. 1.) Shell orbicular or distorted; upper valve very convex, its umbo not reaching the edge, and its surface very variable, its shape dependent upon the shell to which it adheres; lower valve smaller, with a circular hole very near the margin, often with the edge open. Polished black, red, yellow, or ashy to white; interior the same, except the muscular impression which is white. Diameters about 25.—Whole coast. Common south.

2. *Anomia aculeata*, L. Shell smaller than the preceeding, and with the upper valve covered with fine, prickly scales arranged in radiating lines; the umbo reaching the edge; lower valve smooth. Yellowish to whitish. Diameter about 12.—New York and north. Common north.

Family 3. PECTINIDÆ.

Represented only by the genus:—

1. Pecten, Mul.

Shell suborbicular regular, resting on the right valve, usually ornamented with radiating ribs; umbones approximate, eared, making the hinge line straight; only one, very faint, muscular impression; anterior ear more prominent; right valve with a notch below the front ear; ligament narrow; internal cartilage in a central pit.

Animal with open mantle; the margins double, the inner pendent, like a curtain, finely fringed; at its base, a row of many, bright, black eyes, surrounded by tentacular filaments; gills exceedingly delicate, crescent shaped; foot finger like, grooved; one adductor muscle. These animals are very beautiful, and can swim and skip over the sand and mud with great dexterity; the

movement is performed by suddenly opening and closing the valves.

* Decidedly inequivalve; one valve nearly flat; covered with radiating lines rather than ribs.....*3.*
* Valves with radiating ribs. (A.)
A. About 50 on each valve.....*2.*
A. About 20 on each valve.....*1.*

1. *Pecten irradians*, Lam. (Fig. 4.) Shell orbicular, with about 20 elevated, rounded, radiating ribs, and numerous, concentric wrinkles; ears large and nearly equal. Very variable in color, the upper valve darker. Diameters 50–75.—Whole coast. Very common south.

2. *Pecten Islandicus*, Chez. Shell nearly orbicular, with over 50 small, scaly radiating ribs; ears unequal. Diameters about 80, the distance across from the umbo greater.—Mass. and north. More common north. Rather deep water.

3. *Pecten magellanicus*, Gmel. Shell orbicular; the lower valve nearly flat and not quite as large as the upper one; ears nearly equal; surface covered with very numerous and very fine radiating striæ; the striæ of the lower valve less distinct. Upper valve brownish; lower one white. Diameters about 125.—New Jersey and north. Not rare north.

Family 4. MYTILIDÆ. *The Mussels.*

Shell equivalve, oval or elongated, closed; umbones anterior; epidermis thick and dark, often filamentose; ligament external, submarginal, very long; hinge with a few small teeth or usually none; inner shell layer more or less pearly; pallial line simple; anterior muscular impression small and narrow, posterior large, obscure.

Animal marine or fluviatile, attached by a byssus; mantle lobes united between the siphonal openings; foot cylindrical, grooved.

* Surface without radiating ribs, sometimes with faint radiating lines. (A.)
A. Umbones at the anterior end. (B.)
B. Large, over 50 long.....*1. Mytilus.*
B. Small, under 20 long; lunate in form.....*5. Dreissensia.*
A. Umbones near but not at the anterior end.....*2. Modiola.*
* Surface with radiating ribs. (C.)
C. Radiating ribs at both ends of the shell, but a central triangle smooth.....*3. Modiolaria.*
C. Radiating ribs all over the shell. (D.)

D. Twice as long as high.....*2. Modiola.*
D. Less than twice as long as high.....*4. Crenella.*

1. Mytilus, L.

Shell wedge-shaped, rounded behind, usually smooth; umbones terminal, pointed; hinge teeth minute or none.

Animal with the mantle margins plain behind and slightly projecting; byssus strong and coarse.

1. *Mytilus edulis*, L. (Fig. 2.) Shell ovate-triangular, umbones pointed and placed at the end of the shell; basal and hinge margins nearly straight; gonial ridge distinct. Color of shell itself violet to horn color; epidermis usually blue-black; within, silvery white except the margins which are violet; sometimes the colors radiate from the umbo. L. 75; H. 35; W. 30; An. of margins 50°.—Whole coast. Common on rocks and timbers.

2. Modiola, Lam.

Shell oblong, inflated in front; umbones near the anterior end, obtuse; hinge toothless.

* No radiating ribs, sometimes with faint radiating lines.....*1.*
* With radiating ribs.....*2.*

1. *Modiola modiolus*, L. Shell oblong-ovate; umbones tumid and placed on one side near but not at the anterior end; basal margin arched; gonial ridge broad, rounded; shell compressed along hinge margin; radiating lines faint or none. Epidermis thick and leathery, chestnut or brown in color; interior pearly, of a somewhat livid color. L. 100; H. 50; W. 45; An. of margins 45°. Sometimes L. 180.—New Jersey and north. Common; thrown on beach from deep water.

2. *Modiola plicatula*, Lam. Shell quite elongated; umbones as in the preceeding; surface ornamented with numerous radiating ribs; these are most conspicuous above and behind; they are very fine in the podial region. Epidermis greenish-yellow to reddish-brown; within pearly, more or less purple tinted. L. 75; H. 30; W. 23; An. of margins 30°. Sometimes L. 100.—Whole extent. Very common on mud of tide water flats.

3. Modiolaria, Beck.

Shell rhomboidal, ornamented with two sets of rather fine, radiating lines, the middle portion smooth.

1. *Modiolaria nigra*, Gray. Shell ovate, widest behind; the

umbones rather prominent, usually eroded quite a distance from the anterior end; one section of the fine radiations covers the whole upper and posterior part of the shell; the second section, at the anterior end, is small in extent but distinctly radiated; margin not crenulated. Epidermis rusty brown, glossy; interior livid, with pearly or silvery lustre. L. 50; H. 28; W. 15; U. $\frac{1}{10}$. —Connecticut and north. Deep water.

2. *Modiolaria lateralis*, Say. Shell oval, widest near the middle; gonial ridge broad, rounded, and forming a rounded lobe at the gonium; on and above this ridge, the surface is covered with numerous, fine, radiating lines,; in front of the umbo, there are about 8 small, rib like radiating lines. Epidermis olive, with dark, chestnut colored shades; interior brilliantly silvery. L. 30; H. 18; W. 12; U. $\frac{1}{10}$.—Maine and south.

3. *Modiolaria corrugata*, Stim. Shell irregularly oval, tumid, heart-shaped when viewed in front; somewhat lobed at the gonium, as in the preceeding; about 16 ribs in the front section, and many over the back; margin crenulated. Epidermis greenish yellow; within, silvery. L. 11; H. 7; W. 4; U. $\frac{1}{10}$.—Long Island and north. Deep water.

4. Crenella, Br.

Shell oval or rhomboidal, pearly, with radiating ribs; umbones straight; ligament small; a crenulated cardinal tooth in each valve.

Animal with a cylindrical foot having a disk like end issuing out of a sheath; byssus a single thread.

1. *Crenella glandula*, Tot. Shell rounded oval; umbones slightly projecting and (if the shell is held in the mussel position), near the anterior end; surface covered with minute lines of growth, crossed by many, small, rounded, radiating ribs, nearly equal in size, over the whole surface of the shell, the number increasing as the spaces widen. Epidermis thin, brownish yellow; within white, somewhat pearly. L. 12; H. 9; W. 7. These dimensions are of the shell resting on its nearly straight base.—New Jersey and north. Not rare in 3–30 fathoms.

5. Dreissensia, Van B.

Shell like Mytilus, but without its pearly lining.

Animal with the mantle closed, and with siphon tubes.

1. *Dreissensia leucophæta*, Con. Shell crescent shaped, with the posterior end broader and rounded; umbones terminal. Epidermis rough, brownish; interior not pearly. L. 13; H. 7; W. 6. Animal with short siphons.—Maryland and south. On oysters in brackish water.

Family 5. ARCIDÆ.

Shell regular, equivalve, with heavy epidermis; ligament exterior, occupying an area between the umbones; hinge with a long row of similar, comb-like teeth; pallial line distinct and without sinus; muscular impressions nearly equal. Animal with open mantle, large, bent, deeply grooved foot, and very oblique gills.

1. Arca, L.

Shell about equivalve, thick, subquadrate, closed (in our species), with strong radiating ribs; hinge straight, with numerous teeth; umbones anterior, separated by a lozenge shaped space containing the external ligament.

Animal with a long, pointed foot; mantle furnished with ocelli; animal usually attached by byssus; palpi none; gills long and narrow.

* Umbones $\frac{1}{5}$ from anterior end.....*1.*
* Umbones $\frac{1}{3}$ or more from anterior end.....*2, 3.*

1. *Arca pexata*, Say. (Fig. 3.) Shell more rounded than the next; umbones turn obliquely forward and terminate over the anterior end of hinge. Epidermis thick, shaggy, fibrous and dark brown in color. L. 55; H. 42; W. 35; U.$\frac{1}{4}$.—Mass. and south. Not rare.

2. *Arca transversa*, Say. Shell oblong, rhomboidal, with about 33 radiating ribs; lower margin but little curved; umbones situated near the anterior third of hinge as shown by the ligament and the series of teeth. Epidermis chestnut brown. L. 37; H. 25; W. 23; U.$\frac{1}{4}$.—Cape Cod and south. Not rare.

3. *Arca ponderosa*, Say. Similar in shape to A. transversa but the shell is heavier and the ribs are fewer in number and are grooved along their centres; the umbones end over the centre of the series of teeth. L. 60; H. 48; W. 38; U. about $\frac{1}{3}$.—New Jersey and south.

Family 6. NUCULIDÆ.

Shell oval to triangular, small, pearly within: hinge with a

long row of teeth divided into two sets by a pit for an internal cartilage; pallial line entire. Animal with open, plain-edged mantle; foot large forming when expanded a disk with notched margins; mouth minute; palpi very large and furnished with long convoluted appendages; gills small, feather like.

1. Nucula, Lam.

Shell small, somewhat triangular, with the umbones turned toward the short (posterior) end, closed; hinge line curved or angular, with a distinct cartilage pit separating the line of small, sharp teeth on each end.

Animal with plain edged mantle; foot large, forming, when expanded, a disk with serrated margins; palpi very large, and protruding from the shell with the foot; gills small, plume-like. Inhabitants of rather deep water (2 to 100 fathoms) and so are rarely thrown on shore; often found in the stomachs of fishes.

1. *Nucula proxima*, Say. Shell oblique, ovate-triangular, crossed by minute, concentric and radiating lines; umbones prominent; hinge teeth about 12 behind and 18 before the small cartilage pit; the two series of teeth form nearly a right angle; inner edge finely crenulated. Epidermis light olive; interior, pearly. L. 10; H. 9; W. 6; U. $\frac{4}{5}$; An. 85°.—Whole coast.

2. *Nucula delphinodonta*, Migh. Shells oblique, ovate-triangular, tumid; hinge with 3 teeth behind and 7 before the cartilage pit; a deep heart-shaped excavation in front of the umbones bordered by a ridge. Epidermis olive. L. $3\frac{1}{4}$; H. $2\frac{3}{4}$; W. $2\frac{1}{4}$ U. $\frac{2}{3}$; An. 100°.—New England.

Family 7. LEDIDÆ.

Shell more elongated than in the preceeding family, rounded in front and extended and somewhat pointed behind; teeth of the hinge many, divided by a cartilage into two sets; pallial line with a small or large sinus. Animal with partially or wholly united, elongated siphons; gills narrow, feather-like; palpi large.

* Pallial sinus large; cardinal teeth of the two ends about equal in number. ..... *1. Yoldia.*

* Pallial sinus small; teeth of the posterior or narrow end about $\frac{1}{3}$ more than the anterior..... *2. Leda.*

1. Yoldia, Mor.

Shell oblong, compressed, gaping behind, smooth and shining;

external ligament slight, and an internal cartilage in pit between the series of many teeth; pallial sinus deep.

Animal with united, retractile siphons; foot slightly keeled, deeply grooved, its margins crenated; mantle margin plain in front and fringed behind. The animal is very active and leaps around in the water in an astonishing way. Deep water, 2–100 fathoms.

1. *Yoldia limatula*, Say. Shell oblong-ovate, the umbones about central and not prominent; posterior dorsal slope straight, making that end quite angular; anterior and basal margins regularly rounded; cartilage pit small; the teeth extend $\frac{2}{3}$ the length of the shell, 22 on the rounded and 18 on the rostrated end. Epidermis polished, light green; interior bluish-white, somewhat pearly. L. 47; H. 23; W. 12; U. $\frac{1}{2}$; An. 170°.—Whole coast.

2. *Yoldia sapotilla*, Gld. Similar in shape to the preceeding but much smaller; thin, fragile, translucent; cartilage pit deep and triangular; teeth about sixteen on each end. Epidermis highly polished, pale yellowish-green; pearly-white within. L. 22; H. 11; W. 7; U. a little in front of centre; An. 160°.—New England.

2. Leda, Schum.

Shell oblong; rounded in front, pointed behind; pallial line with small sinus.

1. *Leda pernula*, Mul. Shell ovate-lanceolate, front end rounded, hind end much narrowed, rostrated, and slightly turned upward; dorsal surface with a lanceolate, smooth and shining area behind the umbones; below this, a gonial ridge forms an obtuse fold; surface with numerous, concentric folds; cardinal teeth about 13 in front, and 17 back of the cardinal pit. Epidermis light greenish-yellow; pearly-white within. L. 16; H. 7; W. 4; U. $\frac{1}{3}$; An. 160°.—New England.

Order TELEODESMACEA.

Hinge with few transverse or cardinal teeth and usually heavy and strong longitudinal or lateral teeth; substance of shell always limy or porcellanous, never with pearly layers.

Family 8. CARDITIDÆ.

Shell thick, solid, roundly ovate, and covered with radiating

ribs or lines; hinge with about two cardinal teeth in each valve; pallial line entire; ligament external, strong. Animal with mantle-lobes free except at the siphonal end; gills rounded in front, tapering behind and united together.

1. Venericardia, Lam.

Shell suborbicular, radiately ribbed and covered by a rough epidermis; hinge with two robust teeth in the left valve, and one in the right.

1. *Venericardia borealis*, Con. Shell thick and strong, rounded or somewhat heart shaped; umbones projecting well in front in old shells, the rest of the shell evenly rounded; surface raised into about 20, rounded, radiating ribs, which are broader than the grooves between them; the ribs are roughened by coarse lines of growth; lunule rhomboidal, deep; ligament small and sunken; interior margin strongly crenulated. Epidermis strong, rusty brown; interior white. L. 25; H. 25; W. 17; U. $\frac{1}{4}$.—Whole extent.

Var novanglix, Morse. A smaller more elongated and thinner shell, the umbones not so projecting nor so far in front, and the hinge plate much narrower; the radiating ribs are about 17 in number. L. 21; H. 16; W. 14; U. $\frac{1}{3}$.—New England.

Family 9. ASTARTIDÆ.

Shell nearly as in the preceeding family except that there are no radiating ribs, but the shell is either smooth or concentrically striated or furrowed. Animal with a moderate, tongue-shaped foot; lips large, palpi lanceolate; gills nearly equal.

1. Astarte, J. Sowb.

Shell suborbicular, compressed, thick, smooth or concentrically furrowed; lunule impressed; ligament external; hinge teeth strong, about 2 in each valve; epidermis dark.

Animal with mantle open; margins plain or slightly fringed; siphonal openings simple; foot moderate, tongue-shaped.

1. *Astarte undata*, Gld. Shell thick, ovate-triangular, somewhat compressed; anterior end shorter, concave, and with a deep, smooth, lanceolate lunule; a still longer, lunule shaped excavation found back of the umbones; umbones in contact, obtuse; surface covered with from 15–25, strongly developed furrows and ridges; the furrows a little wider than the ridges;

hinge margin strong; 2 large cardinal teeth in the left, and 1 in the right valve. Epidermis brownish olive; interior polished, bluish-white. L. 30; H. 27; W. 14; U. about central; An 120°. —New England. Dead shells common.

2. *Astarte castanea*, Say. Similar in form and solidity to A. undata; but the umbones are more elevated, the lunule is short, broad, deep, smooth, ovate lanceolate; surface very slightly undulated at the stages of growth; ligament small; interior margin, like A. undata, is crenulated in adult shells. Epidermis chestnut color, with usually, the posterior portion curiously blackened. L. 25; H. 25; W. 13; U. about central; An. 110°.—New Jersey and north. Common.

Family 10. CRASSATELLIDÆ.

Shell rounded to oblong, mostly concentrically striated or furrowed, covered with an epidermis; hinge with about 2 teeth in each valve; pallial line entire or with a sinus.

1. Eriphyla, Gabb.

Shell equivalve, somewhat triangular, with concentric ridges or plates; lunule distinct, cardinal teeth 1–2; pallial line about simple.

1. *Eriphyla lunulata*, Con. Shell small, solid, orbicular, with the anterior slope truncated obliquely, or slightly concave, making it quadrant shaped; lunule long and deeply excavated; the surface is undulated, with about 14, concentric, rib-like waves, and is marked between them with minute, regular radiating striæ. Color pale yellowish-green. L. 6; H. 6; W. $2\frac{1}{2}$; U. $\frac{1}{2}$, An. 90°.—Cape Cod and south. Common.

Family 11. ERYCINIDÆ.

Shells very small, thin, fragile, usually transparent, and sometimes gaping; hinge narrow, with one or two cardinal teeth; muscular impressions small and faint; pallial line entire.

* Shell very minute, less than 3 long, translucent; nearly twice as long as high.....*1. Turtonia.*

* Shell over 3 long, compressed.....*2. Kellia.*

1. Turtonia, For. & Han.

Shell oblong, with umbones near anterior end; ligament concealed between the valves; cardinal teeth 2 in each valve.

Animal with only the excurrent siphon which is slender and elongated.

1. *Turtonia minuta*, Fabr. Shell very minute, fragile, semi-transparent, elongated-ovate, rather convex; posterior end narrow and somewhat pointed; umbones slightly elevated; lower margin well curved. Straw color, blending into dark purple at the umbones and posterior slope; interior similar. L. 2; H. 1¼; W. 1; U. ⅛.—New England. Common under stones at low water.

2. Kellia, Tur.

Shell small, thin, suborbicular, closed; umbones small; margin smooth; ligament semi-internal; cardinal teeth, 1 or 2 in each valve.

Animal with incurrent opening in front, and excurrent behind; foot strap-shaped, and with a byssus groove.

1. *Kellia planulata*, Stim. Shell minute, closed, not very thin, oval-oblong, ends broadly rounded; umbones a little prominent, and in contact; lunule elongated, smooth, deep; surface marked with lines of growth, eroded at the umbones; muscular impressions and pallial line faint. White, covered with a rather thick, dirty-brown epidermis; inside white and glossy. L. 4; H. 3; W. 1½; U. ¼.—New England. Under stones at low water; rather rare.

Family 12. UNGULINIDÆ.

Shells rounded, small, thin, with slender cardinal teeth or none; ligament partially or wholly internal.

* Shell minute, elongated, without gonial folds.....*1. Tellimya.*
* Shell globular, with gonial groove.....*2. Cryptodon.*

1. Tellimya, Br.

Shell minute, thin, oblong; umbones back of the centre; hinge line notched; cartilage internal, between two, thin teeth in each valve.

Animal with a single, siphonal orifice; foot large, broad, and with a byssus groove.

1. *Tellimya elevata*, Stim. Shell fragile, slightly gaping, ovate-oblong, both ends obtusely rounded, the front end broader, tumid near the umbones, but compressed near the margins; umbones acute and prominent; surface shining, but rough with the numerous edges of the lines of growth; inside polished, without apparent muscular or pallial impressions, except in very old shells, but with faintly marked, radiating lines; carti-

lage in a small pit of the hinge. White, under a very thin, straw-colored epidermis. L. 5; H. 4; W. 2½; U. ⅝.—New England. Rare.

2. Cryptodon, Tur.

Shell globular, with a gonial groove; umbones much recurved; lunule short or indistinct; ligament in a groove; no cardinal teeth.

Animal without siphonal tubes; foot long and very slender.

1. *Cryptodon Gouldii*, Phil. Shell orbicular-globose; hind margin indented by a groove extending from the umbones, which are small and projecting; lunule rounded; hinge almost toothless; surface smooth. Dead-white; interior glossy-white, with minute, radiating lines. L. 4; H. 5; W. 2½; U. ½.—New England. Rarely thrown on the beach.

Family 13. LUCINIDÆ.

Shell orbicular, white; umbones depressed; lunule distinct; cardinal teeth about two in each valve; ligament in a deep groove or almost internal.

1. Lucina, Brug.

Shell orbicular, umbones depressed; lunule distinct; ligament oblique, semi-internal.

Animal with the mantle freely open below; siphonal openings simple; gills single on each side; foot cylindrical, pointed.

1. *Lucina filosa*, Stim. Shell thick, regularly convex; hinge line straight; umbones small; lunule small, lanceolate; surface covered with numerous, remote, concentric, laminated ridges. Color white or light-brown; interior chalky-white in centre, and polished at the margin. L. 35; H. 35; W. 15; U. about central. —New England. Rare; thrown on the beach by storms.

2. *Lucina (Divaricella) dentata*, Wood. Shell rather thin, orbicular, regularly convex; hinge line slightly curved; lunule long, lanceolate; lines of growth quite distinct and crossed by parallel ridges which extend obliquely downward toward the ends from about the centre of the shell; these ridges form about a right angle where they join each other, and give the shell a dentate edge. White. L. 22; H. 20; W. 12; U. ½.—Cape Cod and south. Dead shells common.

Family 14. CARDIIDÆ.

Shell regular, equivalve, free, cordate, covered with radiating

ribs; cardinal teeth two in each valve; ligament external, short and prominent; pallial line entire or with a slight sinus.

Animal with usually short-fringed siphons; gills two on each side, thick; foot long, curved.

* Shell with distinct radiating ribs.....*Cardium*.
* Without prominent radiating lines.....*Liocardium*.

1. Cardium, L.

Shell with prominent radiating ribs.

Animal with the siphons clothed with tentacular filaments; incurrent orifice fringed, excurrent with a tubular valve; foot long, sickle-shaped.

1. *Cardium pinnulatum*, Con. Shell small, fragile, nearly orbicular; umbones small, slightly elevated; surface with about 26 rounded, radiating ribs separated by deep, linear grooves; ribs rendered rough by equidistant, arched scales; inside with radiating grooves. Dingy white; interior white or flesh colored, sometimes with a posterior, brownish blotch. L. 11; H. 10; W. $7\frac{1}{2}$; U. $\frac{3}{7}$.—New York and north.

2. *Cardium Islandicum*, L. Shell large, rather thin, rounded ovate; umbones rather large, prominent, approximate; surface with about 36, three sided, sharp-edged, radiating ribs, the furrows rounded, and regularly wrinkled by the lines of growth; inside with radiating grooves. Epidermis of live shells lax, and bristling into a stiff fringe on the sharp edges of the ribs, yellowish-brown color; straw color within, somewhat pearly. L. 50; H. 42; W. 25; U. $\frac{1}{3}$.—Cape Cod and north. Only dead shells rarely thrown upon the beach from deep water.

3. *Cardium magnum*, Born. Shell very large, obliquely cordate, ventricose, posterior side somewhat angularly depressed; surface with about 35 flattened, close set, radiating ribs, the front ones crenulated. Yellowish-brown, painted with transverse rows of purple-brown spots, the depressed posterior area entirely purple brown. L. 100; H. 110; W. 75; U. $\frac{3}{7}$; An. 105°.—Virginia and south.

2. Liocardium, Sw.

Shell oval, elongated, oblique; umbo about central; surface smooth or lightly radiately striate.

1. *Liocardium Mortoni*, Con. Shell thin, inflated, globular; umbones large and prominent; surface smooth, glossy, with no ribs,

and the lines of growth very fine. Color very pale yellowish, covered by a thin, darker epidermis; young specimens are covered more or less with zigzag blotches of fawn color; inside margin white, centre bright yellow with a dark, purplish blotch along the posterior side. L. 23; H. 23; W. 20; U. nearly central.—Whole coast. Most abundant on shallow flats, and at creek mouths; rare north of Cape Cod.

Family 15. VENILIIDÆ.

Shell solid, rounded, closed; epidermis thick and dark; ligament large external; cardinal teeth three in each valve; pallial line almost entire; siphons very short; foot thick.

1. Cyprina, Lam.

Shell oval, large, strong; no lunule; no pallial sinus.

1. *Cyprina Islandica*, L. Shell closed, obliquely ovate or heart-shaped, tumid, thick and solid; umbones approximate, usually eroded; epidermis coarse, strong and rough, with crowded and loose wrinkles; inner margin without crenulations. Epidermis dark, shining brown to almost black; inside chalky white. L. 80; H. 75; W. 45; U. ¼.

Animal with a plain mantle open in front and below.—New England. Thrown upon the beach, after storms.

Family 16. VENERIDÆ.

Shell regular, closed, sub-orbicular to oblong; ligament external; hinge with usually three diverging teeth in each valve; muscular impressions oval, polished; pallial line with a sinus.

Animal free, locomotive, rarely byssiferous or burrowing; mantle with a rather large opening for the foot; siphons unequal, united more or less; foot narrow, compressed.

* No lunule; size minute, under 6 long.....*2. Gemma.*
* With well marked lunule; size large, over 25 long. (A.)
A. Length about equal to height.....*4. Dorsinia.*
A. Length plainly greater than height. (B.)
B. Inner edge not crenulated; 4 cardinal teeth in one valve..*3. Cytherea.*
B. Inner edge crenulated; 3 cardinal teeth in each valve. (C.)
C. No distinct, radiating lines; pallial sinus not extending to the middle.....*1. Venus.*

1. Venus, L.

Shell thick, ovate; inner edge crenulated; cardinal teeth 3 in each valve; pallial sinus small, angular; ligament prominent;

lunule distinct. Animal with fringed mantle margins; unequal, somewhat separated siphons with fringed orifices.

1. *Venus mercenaria*, L. (Figs. 5–7.) Hard Shell Clam. Quahog. Round Clam. Shell thick, solid, obliquely ovate or heart-shaped; lunule distinct, heart-shaped; umbones directed forward and inward; teeth three in each valve; surface covered with numerous, laminated, concentric lines or ridges; ligament large; pallial sinus acute, not very deep; interior margin crenulated, especially along the lower and front edges. Dirty or chalky white; within pure white with some bright violet near the distinct muscular impressions. L. 75; H. 60; W. 50; U. $\frac{1}{6}$.—Whole coast. Common, especially south of Mass.

2. Gemma, Desh.

Shell minute, rounded, smooth; margin crenulated; hinge short, narrow; cardinal teeth 2–3.

1. *Gemma purpurea*, H. C. Lea. Amethystine Gem. Shell minute, nearly round; umbones slightly elevated, generally eroded; no defined lunule; muscular impressions and pallial line distinct; the pallial sinus ascending, acute; 3 cardinal teeth in left valve, 2 in the right; inner margin crenulated; surface shining, with minute, concentric, crowded furrows. Yellowish, white or rosy, with the umbones and posterior end usually amethyst color. L. 4; H. $3\frac{1}{2}$; W. 2; U. $\frac{1}{2}$.—Whole coast. Common on sandy tide flats, just under the surface.

Var Manhattensis, Prime. This variety is smaller, more triangular, and more solid. White, straw-color to purplish. L. 3; H. 3; W. $1\frac{1}{2}$; U. $\frac{1}{2}$.—Mass. and south. Rare.

3. Cytherea, Lam.

Shell similar to Venus, but the margins are not crenulated and the cardinal teeth are 3 in one valve and 4 in the other.

1. *Cytherea convexa*, Say. Very similar in form and parts to Venus mercenaria, but smaller, with 4 cardinal teeth in the right valve, no purple inside, and the edge not crenulated. L. 43; H. 35; W. 24; U. $\frac{1}{4}$.—Whole coast. Rather rare.

4. Dosinia, Scop.

Shell orbicular, compressed, concentrically striated, pale; ligament sunk; lunule deep; hinge with 3–4 teeth.

Animal with a hatchet-shaped foot projecting from the lower side of the shell; siphons united to their ends.

1. *Dosinia discus*, Reeve. Shell nearly round, compressed, with five, regular, impressed, concentric lines; umbones quite sharply pointed; lunule cordate, slightly impressed; hinge with a large, oblong groove under the umbones; muscular impressions very large; pallial sinus deep, ascending. Epidermis yellowish-white. L. 66; H. 61: W. 22; U. nearly $\frac{1}{3}$.—Virginia and south.

Family 17. PETRICOLIDÆ.

Represented only by the genus:—

1. Petricola, Lam.

Shell oval or elongated, thin, tumid; umbones near anterior end; hinge with 2 or 3 teeth in each valve; pallial sinus deep.

1. *Petricola pholadiformis*, Lam. (Fig. 15.) Shell oblong-elliptical, swollen, gaping, with a distinct, ovate lunule on the short (anterior) end, and a moderate, projecting, external ligament on the long end; hinge with two teeth in each valve; pallial sinus deep, horizontal; surface covered with elevated, radiating lines: 7 or 8 of the front ones are distant, coarse, and toothed; back of these, they are much closer, finer, and but slightly roughened by the distinct lines of growth; interior with radiating furrows. Chalky white. L. 32; H. 14; W. 11; U. $\frac{1}{5}$, often larger.

Animal with mantle united except for the siphons and foot; siphons long, slender, separated, except at base, the lower one fringed; foot triangular, long and narrow.—Common south of Cape Cod, rare north. Boring in clay.

Family 18. DONACIDÆ.

Shell closed, triangular-wedge-shaped, usually thick; ligament short external; cardinal teeth two in each valve; pallial sinus deep, horizontal. Animal with fringed mantle and short separated siphons.

1. Donax, L.

Shell trigonal, wedge shaped, closed; front rounded, back pointed; ligament external; pallial sinus deep.

Animal with fringed mantle and short, thick, diverging siphon; foot very large.

1. *Donax fossor*, Say. (Figs. 12–14.) Shell triangular wedge-shaped, closed; anterior end elongated, rounded; the hinge slope straight to the tip; posterior end obliquely rounded, very short, external ligament very short, prominent, on the shorter end of

the shell; ventral margin slightly rounded; basal edge crenulated within; pallial sinus deep; surface with radiating and concentric striæ. Pale, livid, with or without obscure rays. L. 12; H. 7; W. 4; U. $\frac{2}{3}$; An. 135°.—New York and New Jersey. Abundant.

Family 19. PSAMMOBIIDÆ.

Shell elongated, gaping, with nearly central umbones; pallial sinus deep; cardinal teeth two in each valve; ligament long and prominent.

1. Tagelus, Gray.

Shell elongated, with subcentral umbones; margins nearly parallel; ends truncated; external ligament prominent; two cardinal teeth in each valve; pallial sinus very deep, rounded.

Animal very large and thick, not entirely retractile within the shell; mantle closed below; siphons separated at the ends, united and forming a thick mass at their bases; incurrent orifice fringed, excurrent plain.

1. *Tagelus gibbus*, Speng. Shell thick and solid, oblong, the external ligament on the shorter (posterior) end of the shell; the anterior end wider; ends somewhat obliquely truncated; pallial line distinct, with a very deep sinus; valves with two awl-shaped teeth, and, behind them, a thick rounded callus to which the ligament is fixed; lines of growth distinct. Epidermis wrinkled, straw-colored. L. 90; H. 30; W. 20; U. $\frac{4}{7}$.—Cape Cod and south. Common in sand or mud, at about low water mark.

2. *Tagelus divisus*, Speng. Shell rather thin and delicate, oblong-oval, the centre curved upward; umbones not prominent, central; hinge with two large teeth in each valve; surface somewhat wrinkled at the ends, smooth in the centre. Epidermis yellowish, with a purple band extending from umbo to base. L. 35; H. 12; W. 9; U. $\frac{1}{2}$.—Cape Cod and south. Rather common.

Family 20. TELLINIDÆ.

Shell elongated, nearly or entirely equivalve, with one or two cardinal teeth in each valve; pallial sinus deep and usually wide; ligament external, prominent.

* Compressed shells, width about one third height.....*1. Tellina.*
* Convex shells, width about half height. (A.)
A. Large shells, over 12 long.....*2. Macoma.*
A. Minute, under 6 long.....*3. Gastranella.*

1. Tellina, L.

Shell slightly inequivalve, compressed, rounded in front, angular and slightly folded behind; umbones nearly central; ligament prominent.

Animal with long, slender, diverging siphons, their orifices plain.

1. *Tellina tenera*, Say. Shell oblong, sub-oval, longer and rounded in front, somewhat pointed behind, thin, pellucid, delicate; surface regularly and delicately marked by sharp lines of growth; pallial sinus nearly reaching the anterior muscular impression; one distinct, grooved, cardinal tooth in each valve, the second indistinct; ligament short. Color white, or slightly tinged with rose-color, sometimes concentrically banded, polished and iridescent. L. 14; H. 9; W. 3; U. $\frac{3}{5}$; An. 130°.—Whole coast. Abundant on sandy beaches.

2. *Tellina tenella*, Verrill. Shell oblong with the front dorsal margin nearly straight or sometimes concave; umbones scarcely prominent; posterior end short, sloping rapidly from the umbones and somewhat truncate at the end; ventral margin slightly convex; ligament longer than in the preceding species; color pink, light straw-color, or white often banded concentrically with these colors and rendered somewhat iridescent with very fine concentric striæ. L. 14; H. 9; W. 3; U. $\frac{2}{3}$; An. 140°. Cape Cod and south in 4–10 fathoms.

2. Macoma, Leach.

Shell oval, convex, umbones small; cardinal teeth narrow, two in each valve; lateral teeth none.

Animal with a single branchial lamella on each side.

1. *Macoma tenta*, Say. Shell oval-ovate, shorter, narrower, widely gaping and very much warped behind; valves very convex, the left one more so and with its posterior end bent outward; outer surface shining but not polished, minutely wrinkled by lines of growth and a few, fine, radiating lines across the middle; two cardinal teeth in right valve, and one in the left; ligament short; muscular and pallial impressions distinct. White. L. 15; H. 10; W. 5; U. less than $\frac{3}{5}$; An. 150°.—Cape Cod and south. Common in mud.

2. *Macoma baltica*, L. Shell thin, fragile, oval-orbicular, slightly narrowed and pointed behind; cardinal teeth, two in each valve, slender and slightly diverging; muscular impressions distinct;

pallial sinus deep; surface with fine, concentric wrinkles; a slight, wave-like gonial ridge. White, covered with whitish or dusky epidermis. Very variable in size, solidity and color. In muddy bays, they grow to a large size, are thick and bluish, and have a thick epidermis; in clear, sandy localities, they are delicate, thin, pure white to pink. L. 23; H. 18; W. 9; U. ½—Whole coast. Abundant.

3. *Macoma subulosa*, Speng. Shell subovate, thin, brittle, slightly gaping; anterior end longer and well rounded; posterior end wedge-formed, with a somewhat truncate end; gonial ridge a roughened wave; pallial sinus reaching nearly to the anterior muscular impression; surface undulated by the lines of growth. Epidermis thin, dirty white to dusky; interior, bluish white. L. 23; H. 15; W. 6; U. ⅔; An. 140°.—Conn. and north.

3. Gastranella, Verrill.

Shell oblong, more or less irregular, and sometimes with the ventral margin inflexed; pallial sinus large; ligament external, elongated; right valve with two small cardinal teeth, the posterior one thin and oblique; left valve also with two, the posterior one stout, bilobed; no distinct lateral teeth. Animal with long, slender, fringed, separated siphon tubes; mantle well open in front; foot strap shaped.

1. *Gastranella tumida*, Verrill. Shell elongated-oval or oblong with rounded ends, compressed posteriorly; umbones rounded, somewhat prominent, incurved but not approximate, directed forward; no distinct lunule, but deeply concave in front of umbones; ventral margin variable, slightly convex, straight or sometimes even concave; posterior end usually rounded sometimes decidedly prolonged; surface marked with fine, irregular lines of growth or striæ, slightly iridescent. White with purple umbones. L. 4; H. 2½; W. 1½; U. ⅓.

Family 21. SEMELIDÆ.

Shell thin, subequivalve, gaping and usually twisted at the posterior end; with both a short external ligament and an internal cartilage. Siphons long, separated.

* Elongated shells.....*1. Cumingia.*
* Length and height nearly equal.....*2. Semele.*

1. Cumingia, G. B. Sowb.

Shell oval, equivalve, rounded in front, somewhat rostrated

and gaping behind; small, thin, often irregular in form; pallial sinus very wide.

1. *Cumingia tellinoides*, Con. Shell equivalve, ovate-triangular, rounded and tumid in front, pointed, compressed, warped and slightly gaping behind; thin and fragile; stages of growth marked by sharp, thin, raised ridges; cartilage pit shallow and directed slightly backward; lateral teeth at both ends in the right valve, none in the left; muscular impressions faint; pallial sinus wide and deep. Bluish white, glossy white within. L. 15; H. 11; W. 5; U. $\frac{1}{2}$; An. 120.°—Cape Cod and south. Common in shallow water.

2. Semele, Schum.

Shell rounded, subequilateral, umbones turned forward; posterior side slightly folded; hinge teeth two in each valve, laterals elongated, distinct in right valve; external ligament short, internal cartilage long, oblique; pallial sinus deep, rounded.

1. *Semele reticulata*, Gmel. Shell orbicular, somewhat compressed; umbones nearly central, slightly prominent; lunule small; valves sculptured with fine thread-like concentric ridges the spaces between them are (under a lens) finely radiately striated; interior cartilage cavity deep, fusiform, parallel with the anterior slope. Yellowish-white. L. 30; H. 30; W. 11; U. $\frac{1}{2}$. Virginia and south.

Family 22. PAPHIIDÆ.

Shell elongated, usually somewhat triangular, equivalve, closed; cartilage in an internal cardinal pit. Siphons separated.

1. Ceronia, Gray.

Shell oval-wedge-form, truncated behind; lateral teeth coarsely, obliquely striate.

1. *Ceronia arctata*, Con. Shell subtriangular, wedge-shaped, thick and strong, the posterior part short, truncated, forming the base of the wedge, closed; hinge with a very deep cavity for the cartilage; surface with occasional, concentric ridges; muscular impressions distinct; pallial sinus about the size of the posterior impression. Covered with a golden yellow epidermis reflecting a metallic lustre. L. 35; H. 25; W. 14; U. $\frac{5}{7}$; An. 115°.—New York and north. Common.

Family 23. SOLENIDÆ.

Shell elongated, gaping at both ends; ligament external; car-

dinal teeth usually two to three in each valve. Animal with a very large and powerful foot; siphons short and united; gills narrow.

* Very elongated shells, over 4 times as long as high.....*1. Ensis.*
* Not 4 times as long as high.....*2. Siliqua.*

1. Ensis, Schum.

Shell very long, subcylindrical, straight or slightly curved, margins parallel; ends gaping; umbones nearly terminal; hinge teeth one in each valve; ligament long, external; pallial sinus short and square.

1. *Ensis viridis*, Say. Shell smooth, 5 times as long as high; hinge margin nearly straight; basal margin slightly curved; anterior end somewhat truncate, posterior rounded; hinge with one tooth in each valve. Epidermis light green, glossy. L. 50; H. 10; W. 6; U. $\frac{1}{16}$.—New Jersey and south.

2. *Ensis Americanus*, Gld. Shell smooth, 6 times as long as high; edges parallel and curved downward; both ends somewhat truncate; right valve with one projecting cross tooth at anterior end, and a longitudinal, ridge-like tooth extending 10 mm. towards the other end; left valve with two cross teeth 10 mm.apart, and a double ridge between them. Epidermis glossy greenish-olive, the long triangular space faded purple. L. 150; H. 25; W. 16; U. $\frac{1}{16}$.—Whole coast. Common, near low water mark, in sand.

2. Siliqua, Mege.

Shell oblong, smooth, with a polished epidermis, and a rib extending from the umbo across the shell on the interior surface.

1. *Siliqua costata*, Say. Shell thin, fragile, smooth, oblong-oval, with a rib-like, white ridge, extending from the umbo nearly across the inside of the shell. Epidermis polished, violaceous near the umbones, shading into olive at the margins; the violet more or less in triangular areas. L. 45; H. 18; W. 7; U. $\frac{1}{4}$.—New Jersey and north. Common in many localities.

Family 24. MACTRIDÆ.

Shell equivalve, trigonal, closed or slightly gaping, with an internal cartilage contained in a deep, triangular pit; two diverging cardinal teeth; pallial sinus usually short, rounded.

Animal with mantle quite widely open; siphonal tubes joined and with fringed openings.

* But slightly gaping; shell quite thick.....*1. Mactra.*
* Very decidedly gaping; shell quite thin and fragile.....*2. Labiosa.*

1. Mactra, L.

Shell elongated, slightly gaping at the ends.

Animal with a fringed mantle open to the siphons; foot with a bend like a knee.

* Over 50 long.....*1.*
* Under 20 long.....*2.*

1. *Mactra solidissima*, Dillw. (Fig. 8.) Shell large, solid, subovate to subtriangular; spoon shaped cavity for the cartilage very large and broad; muscular and pallial impressions very distinct; pallial sinus quite shallow; lateral teeth long, thin, and striated. Epidermis dirty brown. L. 110; H. 75; W. 45; U. $\frac{3}{8}$ An. 115°. Shell sometimes much larger at the north. The southern and small form is var. similis, Say.—Whole coast. Common. This is the Beech, Giant or Dipper clam.

2. *Mactra lateralis*, Say. Shell triangular to quadrilateral, the umbo and the posterior point making the most distinct angles of the outline; cartilage pits small and deep; muscular impressions deep; pallial line distinct, with a shallow sinus; surface with minute concentric wrinkles, otherwise smooth and shining. White, covered with a thin, dirty brown epidermis; inside clear, glossy white. L. 15; H. 12; W. 10; U. $\frac{1}{2}$; An. 120°.—Massachusetts and south. Common.

2. Labiosa, Schm.

Shell oblong, widely gaping, reflected posteriorly, and with a distinct gonial ridge; internal cartilage and external ligament somewhat united.

1. *Labiosa canaliculata*, Say. Shell ovate-orbicular, very thin and fragile, inflated; anterior end rounded, posterior somewhat pointed; surface covered with regular, rounded, concentric ridges and grooves, which show also on the inside; decidedly gaping behind; cartilage in pits and connected with a subexternal ligament. White. L. 65–75; H. 55; W. 36; U. $\frac{1}{7}$.—New Jersey and south.

2. *Labiosa lineata*, Say. Shell oval, thin, with both ends gaping, the posterior end widely so; gonial ridge keel like; surface unequally and very slightly wrinkled. White. L. 72; H. 50; W. 28; U. $\frac{2}{3}$.—New Jersey and south.

Order ANOMALODESMACEA.

Hinge imperfect, often without teeth, ligament, or cartilage, frequently strengthened by extra valves; substance of shell often hard and brittle; sometimes with pearly layers.

Family 25. ANATINIDÆ.

Shell oval to oblong, more or less inequivalve, closed or gaping slightly at one end; both external ligament and internal cartilage; pallial line obscure.

* Ends of shell quite different; 2 gonial ridges.....*1. Thracia.*
* Ends much alike; no distinct gonial ridges.....*2. Periploma.*

1. Thracia, Blainv.

Shell inequivalve, gaping at the narrow posterior end.

Animal siphons rather long, with separated, fringed orifices.

1. *Thracia Conradi*, Cout. Shell ovate-orbicular, rounded before, narrowed and truncated behind, thin, fragile and slightly gaping; right valve larger and much more convex than the left; two gonial wave-like ridges extend to the sides of the truncated end; ligament large, rounded; pallial impressions broad and deep; sinus acute. Exterior ashy, interior chalky-white, pearly between; epidermis, when seen, brownish. L. 75; H. 65; W. 38; U. ½; sometimes larger.—New England. Rare.

2. Periploma, Schum.

Shell oval, very inequivalve, slightly pearly; internal cartilage in spoon-shaped pits.

Animal siphons long, slender and divided throughout.

1. *Periploma* (*Cochlodesma*) *Leanum*, Con. Shell sub-oval, very thin, brittle and slightly gaping; the right valve convex and somewhat truncated behind; the left valve nearly flat and rounded at both ends; a spoon-shaped process extends downward and a little backward from the umbo in each valve for internal cartilage; surface wrinkled. White, with a thin yellowish epidermis. L. 35; H. 24; W. 11; U. ½.—Whole coast. Common in 3–10 fathoms; dead shells thrown upon the beach by storms.

Family 26. LYONSIIDÆ.

Shell nearly equivalve, left valve the larger, thin, nearly or quite closed; pallial line obscure, the sinus angular.

1. LYONSIA, Tur.

Shell nearly equivalve, thin, somewhat pearly, truncated posteriorly; pallial line not distinct.

Animal siphons very short, almost wholly united, fringed.

1. *Lyonsia hyalina*, Con. Shell elongated, sub-ovate, thin, fragile, pearly, translucent, with posterior end elongated, narrow, slightly truncated and gaping; hinge margin nearly straight, the rest of the outline regularly rounded; pallial line indistinct, with no well marked sinus; whole surface except umbones covered with delicate, radiating, fringed wrinkles. Epidermis dirty-white. L. 18; H. 10; W. 7½; U. ½. Whole coast. Low water to 40 fathoms; thrown on the beach by storms.

FAMILY 27. PANDORIDÆ.

Shell inequivalve, thin, pearly inside; valves closed, narrowed behind.

1. PANDORA, Hwass.

Shell inequivalve, thin, pearly inside; right valve flat, left not very convex.

Animal siphons very short, united nearly throughout; orifices fringed.

1. *Pandora (Clidiophora) trilineata*, Say. Shell oblong-ovate, rounded before, and with an upward curved, narrow, truncated umbo behind; the hinge margin, for nearly the length of the shell, straight or concave; right valve nearly flat, the left convex; the edge of the flattened valve shutting over the convex one; slightly gaping at the ~~umbo~~ sonium. Pearly-white within, iridescent. L. 30; H. 16; W. 4½; U. about ½. Animal with slender foot and short siphons projecting through small openings in the otherwise closed mantle.—Whole coast. In sand and mud.

FAMILY 28. SOLENOMYIDÆ.

Represented only by the genus:—

1. SOLENOMYA, Lam.

Shell thin, cylindrical, gaping at each end; epidermis thick, horny, shining, extending far beyond the margins, cartilage internal with a peculiar arched or forked support; no cardinal teeth.

Animal with a single siphonal orifice, hour-glass-shaped and serrated; foot proboscis form, truncated and fringed at the end.

The foot is used, in a curious and beautiful way, for leaping and swimming backward and forward through the water without touching bottom; it is also used for burrowing. Usually found buried in mud or sand near low water mark; more abundant in bays.

1. *Solenomya velum*, Say. Shell very thin and fragile, oblong, ends rounded, the front end longer and wider; umbones not elevated at all, but having a pit behind them; surface radiated, with about 15, slightly impressed, double lines; epidermis extends about 2 mm. beyond the edge, and is thinned or notched at the radiations. Epidermis yellowish-brown or chestnut color, the radiating lines lighter; interior of shell bluish-white. Size, including epidermis. L. 25; H. 12; W. 8; U. $\frac{3}{4}$.—Whole coast. Not rare.

2. *Solenomya borealis*, Tot. Similar to the last but larger, thicker and with the epidermis more projecting, more decidedly notched and darker in color. L. 50; H. 22; W. 14; U. $\frac{3}{4}$.—Whole coast. Rare.

Family 29. CORBULIDÆ.

Shell small, inequivalve, thick, gaping in front; hinge consisting of one recurved tooth in one valve, fitting into a notch in the other. Animal with mantle closed except in front, the narrow opening notched; siphons short, united, fringed. Living in sand or mud.

1. Corbula, Brug.

Shell small, inequivalve, thick; umbones nearly central; about one tooth in each valve and an internal cartilage between them. Animal with short, united siphons; orifices fringed; foot thick.

1. *Corbula contracta*, Say. Shell small, ovate-globose, solid; anterior end shorter, broader, rounded and gaping; posterior somewhat pointed; left valve shutting within the edge of the right at the bottom; gonial ridge distinct; one cardinal tooth in each valve and the cartilage between them; surface beautifully marked with regular, smooth, rounded, concentric ridges. Shell white, epidermis brown. L. 10; H. 6; W. 5; U. a little nearer anterior end.—Cape Cod and south.

Family 30 MYIDÆ.

Shell rather strong, opaque and gaping; left valve with a spa-

tulate process for a cartilage. Animal with the mantle almost closed, aperture and foot small; siphons united, partly or wholly retractile; gills elongated, two on each side.

1. Mya, L.

Shell oblong, gaping widely at the ends, left valve with a large, projecting, flattened cartilage process; pallial sinus large.

Animal with a slender, straight foot; siphons long, united to the tips, covered with epidermis, only partially retractile.

1. *Mya arenaria*, L. (Figs. 9–11). Shell ovate, anterior end wider and regularly rounded, posterior end also rounded; surface roughly wrinkled at the lines of growth; epidermis thin; cartilage internal, between a pit under the umbo of the right valve and the large projecting process from the left. Chalky-white; epidermis dirty-yellow. Common size.—L. 85; H. 45; W. 25; U. slightly nearer anterior end.—Whole coast. Abundant in sand and gravel, between tides;—the Clam of New England.

2. *Mya truncata*, L. Similar to the last except in shape and epidermis; this shell being obliquely or squarely truncated at the posterior end which is widely gaping, and the epidermis is thick, tough and prolonged beyond the posterior end into a tube two or three times as long as the shell. L. 70; H. 40; W. 30; U. nearer the posterior end.—Cape Cod and north. Rare.

Family 31. SAXICAVIDÆ.

Shell equivalve, thick, gaping at both ends; hinge with a single cardinal tooth; ligament external, prominent, solid; pallial impression sinuous. Animal elongated; mantle lobes united, with a small opening for the slender foot; siphons large, entirely united or very nearly so, and covered with a thick skin.—Living in sand or mud.

* External ligament on the longer end of shell.....*1. Saxicava.*
* External ligament on the shorter end.....*2. Cyrtodaria.*

1. Saxicava, Belv.

Shell, when young, symmetrical, with two minute teeth in each valve; when old, it is rough and toothless; oblong, equivalve, gaping, with an external ligament; pallial impression a series of elongated pits.

1. *Saxicava arctica*, L. Shell irregularly oblong-oval, the right

valve projecting over the left, except at the shorter end; generally gaping; umbones rather prominent, gonial and podial ridges broad and wavelike, dividing the surface into three, triangular, concave portions; surface coarsely wrinkled. Epidermis thin, dingy-yellow. This species is so variable in form that no general description can be given. It has received, at least, five generic and fifteen specific names. Common size, L. 25; H. 15; W. 10, U. ¼. Sometimes 60 long. Foot of animal very slender, and bright orange-red.—Whole coast. Common, especially north of Cape Cod, from low water downward, on weeds and timbers, and in sand, mud and soft stone.

2. Cyrtodaria, Daud.

Shell oblong; umbones back of centre; ligament large, on the shorter end; hinge thick, without teeth.

Animal very large, mantle closed; siphons united in one thick envelope.

1. *Cyrtodaria siliqua*, Chem. Shell oblong-oval, solid, widely gaping at both ends, without cardinal teeth; umbones not prominent, eroded; ligament large on the shorter end; interior covered with a thick deposit of shelly substance with a fringed edge. Epidermis thick, black, shining. L. 85; H. 35; W. 25; U. ⅓.—Mass and north. Rare.

Family 32. PHOLADIDÆ.

Shell thin, white, brittle, hard and gaping at both ends; armed in front with rasp-like folds; without hinge or ligament but often furnished with extra valves; hinge plate reflected over the umbones; pallial sinus very deep. Animal club-shaped; foot short and truncated; mantle closed in front except for the foot; siphons large and united nearly to the ends, which are fringed. Living in rocks, wood or clay.

* Small shells, 25 or less long.....*3. Martesia.*

* Large shells, 40 or more long; surface covered by rough, radiating ridges, at least on anterior end. (A.)

A. Two or more times as long as high; umbones connected by a broad, reflected hinge plate.....*1. Pholas.*

A. Not quite twice as long as high; hinge plate only slightly reflected.....*2. Zirphæa.*

1. Pholas, L.

Shell elongated, cylindrical; dorsal or hinge margin protected

by two extra valves, one placed in front of the other; the hinge plate broadly reflected over the umbones and a long, free, rib-like projection under them; pallial sinus reaching the centre of the shell. Animal with a large, truncated foot, filling the pedal opening; combined siphons large, cylindrical, with fringed openings.

1. *Pholas* (*Barnea*) *costata*, L. (Figs. 16, 17). Shell large, oblong-ovate, anterior end broader, covered with about 30 radiating, toothed ribs; extra hinge pieces cartilaginous. L. 150; H. 50; W. 50; U. ¼ from anterior end. Animal straw-colored, the tip of the siphons beautifully stippled with mahogany-brown; it burrows several feet deep, and so is difficult to obtain alive. Dead and separated valves are frequently found.—Mass. and south.

2. *Pholas* (*Barnea*) *truncata*, Say. Shell oblong or somewhat five sided, the anterior end being triangular and sharp pointed, the posterior broadly truncate; the surface covered with coarse lines of growth, and the anterior two thirds with rough, radiating riblets formed of toothed projections; extra hinge pieces shelly. L. 75; H. 35; M. 30; U. ⅓. Animal dark, smoky color. Mass. and south.

2. Zirphæa, Leach.

Shell oval, cardinal margin slightly reflected; no extra valves, but a membrane in their place.

1. *Zirphæa crispata*, L. Shell quite thick and strong, oval-oblong, rounded behind, somewhat triangular but not acutely pointed in front, gaping widely in front; surface nearly equally divided by a broad furrow extending from umbo to base, the front portion covered with rough, radiating ribs; hinge margin only slightly reflected, and a protecting membrane instead of extra valves. L. 60; H. 35; W. 34; U. nearly ½. Frequently larger, sometimes over 100 long.—Whole coast.

3. Martesia, Leach.

Valves lengthened behind, when full grown, by a plain border; umbonal valves one or two; surface with one or more furrows.

1. *Martesia cuneiformis*, Say. Shell somewhat wedge-shaped; posterior end about ½ the width of the anterior end and rounded; anterior end somewhat truncated; a deep furrow extends across

the shell from umbo to base; posterior end widely, the other slightly gaping; interior rib-like process slender, curved; one extra valve over the umbones, ovate-triangular, white. L. 20; H. 11; W. 12; U. ¼.—Connecticut and south. Boring in wood and oyster shells.

2. *Martesia Smithii*, Try. Shell short, ovate; in other points, much like the preceding except that there are two extra valves at the hinge margin, the large one just over the umbones, and the small one in front of it. L. 15; H. 10; W. 12; U. ⅓.—Staten Island. In oyster shells.

Family 33. TEREDIDÆ.

Animal worm-shaped, its two long siphons furnished at their ends with two limy pieces called pallets; valves gaping, short, with an internal spoon-shaped process extending from the hinge. Animal and valves contained in an irregular limy tube, with which it lines its burrows in timber or clay.

* Pallets with the blades not feather-like .....*1. Teredo.*
* Pallets with the blades composed of joints, making them feather-like.....
.....*2. Xylotrya.*

1. Teredo, L. *The Ship Worms.*

Shell globular, open widely at both ends, lodged at the inner end of a burrow which is entirely lined with shell; valves three lobed, the hinge plate reflected over the umbones, and having a long, tooth-like process under each. The extra valves (pallets) are spatulate in form, and are found at the end of the siphon tubes.

Animal long and worm-like, living in wood which it rapidly destroys, doing great damage to ships and wharves.

* Height ½ greater than length of the shell.....*4, 5.*
* Height about equal to the length of the shell. (A.)
A. Length 6 or more.....*1–3.*
A. Length 4 or less.....*6.*

1. *Teredo navalis*, L. (Figs. 18–20). Length and height of valves equal; posterior auricle expanded, extending much below the anterior one which is small; pallets rounded on one side, flat on the other, notched at the end; the stalk about equal to the blade in length. Shell L. 6; H. 6: Pallet L. 6; W. 2. Stalk 2½.—Massachusetts and south. Very common.

2. *Teredo megotara*, Hanl. Length and height of valves about equal; posterior auricle large and separated from the umbo by

a narrow, deep, rounded notch; the tube in which the animal lives is not divided into chambers; pallets with the blade obovate, very slightly or not at all notched, and with the stalk only half as long. Shell L. 6–12; W. 6–12: Pallet L. 4–6; W. 2–3. Stalk 2.—Mass. and south. Common in floating drift wood.

3. *Teredo dilatata*, Stim. Similar in shell and pallets to the last species; but the posterior auricle is not separated by a deep notch, and the end of the tube in which the animal lives is divided into many chambers.—L. 6; H. 5½. Pallet L. 5; W. 2½. Stalk 1. Mass. and south Not common.

4. *Teredo Thomsonii*, Try. Length of valves ⅛ less than height; anterior and posterior auricles but little different in size, the posterior one does not extend as low as the anterior one; pallets with oval blades, having, on one side, a smooth, horseshoe-shaped rim enclosing a depressed, striated area; stalk very short; tube not chambered. Shell L. 6–9; H. 8–12. Pallet L. 5–8; W. 2–3. Stalk 1.—Mass.

5. *Teredo norvegica*, Speng. Valves solid, higher than long, the two auricles ending below at about the same level, and with their dorsal margins concave; pallets spade-shaped, square at tip, and with the stalk as long as the blade; tube chambered at entrance. Shell L. 14; H. 15; W. 17. Pallet L. 21; W. 6.—New England. Rare.

6. *Teredo (Lyrodus) chlorotica*, Gould. Valves rhomboidal a very little higher than long; umbones enveloped in the callus of the triangular area, which is large, ascendent, obtuse at point, with about 40 divergent square ribs with the interspaces finely barred; pallets paddle-shaped, the stalk flexuous and very delicate, the blade half as long, lyre-shaped, the extreme ⅔ covered with a dark crust which has a projecting horn at each angle. The minute size and globular form of the shell and the very peculiar pallets make it remarkable and has caused the formation of the subgenus Lyrodes. Shell about 3 in all directions. Pallet L. 5; W. ¾; stalk 2¾.

2. Xylotrya, Leach.

Siphonal pallets long and feather form, the blade being made up of articulated pieces arranged like the parts of a feather.

1. *Xylotrya fimbriata*, Jef. Valves similar to Teredo navalis, but the pallets are oar-shaped with the blade marked feather-like

by 10 or 12 cross ridges which give the edges a serrated outline; stalk about equal to the blade in length, and ⅓ the width. Shell L. 6; H. 6. Pallet L. 12; W 2; Stalk 7.—Mass. and south. Rare.

CLASS II. GASTROPODA.

Head distinct, usually furnished with eyes and tentacles; body, in most species, protected by a spiral or conical univalve shell, rarely naked, never with a bivalve shell; lower surface of animal developing a thickened, expanded, creeping disk or foot, except in the aberrant order Pteropoda.

Order PTEROPODA.

Small, free swimming, brightly colored, gregarious, pelagic mollusks usually naked, but sometimes protected by a thin external or internal often membranaceous shell. The peculiarity which gives them their name is the wing-like projections used in swimming; the head is small; the mouth small, sometimes tentaculate, and furnished with a radula. The sexes are united in the same individual. Very abundant in the Arctic seas; certain species furnish the chief food of the whale. They come to the surface mainly in the evening, and occasionally have been found quite abundant near shore. The scope of this book hardly needs their introduction, but a few species are given.

Suborder THECOSOMATA.

Animal furnished with a shell; head rudimentary.

Family 34. LIMACINIDÆ.

Represented mainly by the genus:—

Limacina, Cuv.

Shell present, external, minute (length 1–5), spiral, sinistral, transparent; operculum paucispiral, glassy. Animal with narrow, simple fins attached to the sides of the mouth and united ventrally; mouth central, with prominent lips. Pelagic.

Limacina retroversa, Fleming. (Fig. 21). Shell ovate globose, very thin, pellucid; umbilicus deep, narrow; whorls 7 with minute revolving lines; aperture equals the spire. L. 2½; D. 1¾.—Arctic seas to N. J. Several other species are known but the shells are rarely ever seen on shore.

Family 35. CAVOLINIIDÆ.

Shell straight or slightly curved, globular or needle-shaped: no operculum; animal with two large fins.

* Shell bulging and somewhat globular, with 3 teeth or spines at the posterior end.....*1. Cavolinia.*
* Shell long, slender, conical, gradually tapering.....*2. Creseis.*

1. Cavolinia, Abild.

Shell bulging, translucent; aperture contracted, with a slit on each side; posterior extremity three-pointed. Animal with long appendages to the mantle, passing through the slits of the shell; tentacles indistinct; fins united by a semicircular lobe, representing the foot.

1. *Cavolinia tridentata*, Forskä. (Figs. 22, 23). Body short, furnished with lateral appendages; shell globular, thin, pellucid, yellowish, very finely striated transversely; terminal spine about half as long as the body of the shell.—Fortieth parallel and south.

2. *Cavolinia trispinosa*, Les. Shell globular, ending in a spine as long as the body; lateral spines only ½ as long. L. 10.—Whole coast.

3. *Cavolinia uncinata*, Rang. Terminal spine but little longer than the side ones, each about a third as long as the shell. L. 6.—Fortieth parallel and south.

2. Creseis.

Shell slender, conical, pointed, straight or slightly curved. Animal with rather narrow, truncate fins with small tentacles projecting from their dorsal surface.

1. *Creseis conica*, Eschscholtz. (Figs. 24, 25). Shell long, slender, conical, smooth, polished, diaphanous, and slightly curved towards the acute apex. L. 12; D. 2. Animal white; swimming organs obovate, and with two tentacles on the inner front edges.—Whole extent.

Sub-order, GYMNOSOMATA.

Animal naked, without mantle or shell; head distinct, swimming lobes attached to the sides of the neck.

Family 36. CLIONIDÆ.

Represented only by the genus:—

1. Clione, Pallas.

Head provided with two eye-tubercles and two tentacles; mouth with lateral lobes; fins ovate, attached to the sides of the neck; foot lobed.

Cliona limacina, Phipps. Gelatinous, pellucid, pale blue, hyaline; mouth and end of body scarlet when out of water; wings ovate, pointed; tail acute. L. 25.—Maine.

Order OPISTHOBRANCHIATA.

Mollusks with a flat foot; gills usually present and exposed, but sometimes absent; the branchial veins open into the auricle behind the ventricle; usually without a shell; the shell, when present, thin and wholly or partially concealed by the animal.

Suborder TECTIBRANCHIATA.

With one exception, the animal in all the species included in this work is provided with a small spiral shell which is often partly or completely enclosed in the reflected margin of the mantle or foot; gills usually on the right hand side, and always hidden.

Family 37. ACTÆONIDÆ.

Only represented by deep water species; the following found in rather shallow water.

1. Actæon, Montf.

Shell solid, ovate, with a conical, many-whorled spire; spirally grooved, or punctate-striate; aperture long, narrow, rounded in front; outer lip sharp; columella with a strong, tortuous fold; operculum horny, elliptical, lamellar. Animal white; head truncated, and slightly notched in front, furnished posteriorly with recumbent, tentacular lobes, and small eyes near their inner bases; foot oblong, lateral lobes slightly reflected on the shell.

1. *Actæon puncto-striata*, C. B. Ad. Shell minute, elongated, oval; spire sharply pointed; whorls shouldered at the suture which is somewhat channeled; body whorl smooth above the aperture, but below it is marked with 10–15 revolving lines formed by minute punctures; outer lip sharp and regularly curved; pillar-lip with a prominent fold. White. L. $2\frac{1}{2}$; D. $1\frac{3}{4}$; A. 60°; W. 4–5; Ap. $\frac{1}{2}$.—N. Y. and Mass.

Family 38. TORNATINIDÆ.

Shell external, spiral, more or less cylindrical, usually white; no operculum. Animal with a depressed head, triangular or four sided; eyes at the outer bases of tentacular lobes.

* Spire conspicuous; inner lip with one fold.....*1. Tornatina.*
* Spire about flat; inner lip smooth.....*2. Utriculus.*
* Spire sunken; inner lip with 1-2 folds.....*3. Cylichnella.*

1. Tornatina, A. Ad.

Shell cylindrical or fusiform, spire conspicuous, apex sinistral, suture channeled, columella callous, one-plaited. Animal with a broad, trigonal head, rounded in front; tentacular lobes triangular, with eyes at their outer bases; foot short.

1. *Tornatina canaliculata*, Say. Shell cylindrical, polished, with very faint lines of growth; spire a little elevated, with a minute but prominent tip; the summit of each whorl has a shallow, rounded groove; inner lip with a single oblique fold or tooth near the base. White, without spots. L. 3–5; D. 1½–2½; An. 150°; Wh. 5; Ap. ⅘.—Mass. and south.

2. Utriculus, Br.

Shell rather thin, sub-cylindrical, with short spire and thin epidermis; aperture narrow behind, wider in front; columella not plicated; outer lip thin, straight.

1. *Utriculus Gouldii*, Cout. Shell ovate, shining; spire nearly flat, showing all the whorls; aperture narrow for about ⅓ of its length, then suddenly enlarges by the curvature of the inner lip which is a little thickened, white and polished. White with yellowish epidermis. L. 7½; D. 2½; Wh. 4; Ap. whole length.—Cape Cod and north. In rather deep water.

3. Cylichnella, Gabb.

Shell sub-cylindrical, spire sunken; aperture wide in front, narrow behind; columella with one or two folds.

1. *Cylichnella oryza*, Tot. Shell oval, not very thin, glossy and smooth except under a magnifier when the ends will show a few minute, revolving lines and lines of growth; outer lip regularly curved and sharp; inner lip thickened, smooth, glossy, and twisted so as to form an oblique fold. White. L. 7⅛; D. 2½; Ap. full length of shell.—Cape Cod and south.

Family 39. SCAPHANDRIDÆ.

Shell thin, transparent, oval-globular; spire very short; aperture very wide in front; outer lip thin, sinuous. Head broad and short; tentacular lobes short, conical, wide apart, with eyes sunken in their hind bases.

1. DIAPHANA, Br.

Shell thin, transparent, oval-globular; spire very short; aperture much widened in front; columella a little sinuous; outer lip sinuous. Head disk broad and short; tentacular lobes short, conical, lateral, wide apart; foot short, bilobed behind.

1. *Diaphana debilis*, Gld. Shell obliquely ovate, small, transparent, smooth, partially umbilicated; whorls terminating in a level spire; pillar lip terminating abruptly in front. Greenish white. The last whorl includes all the others. L. $3\frac{1}{2}$; D. $2\frac{1}{2}$; An. 180: Wh. 4; Ap. 1.—Northern; south to N. J.; 6–50 fathoms.

FAMILY 40. BULLIDÆ.

Shell external but partially covered by the side lobes of the foot; spire involute.

1. HAMINEA, Leach.

Shell oval-globular, spiral, horny, thin, white or colorless; covered with a slight epidermis.

1. *Haminea solitaria*, Say. (Fig. 53). Shell thin, fragile, pellucid, oval, and covered with numerous, minute, revolving lines; more or less of a pit in place of a spire; aperture narrowly linear above, wide below; umbilicus none; outer lip regularly curved. White. L. 9; D. 6.—Whole coast. Common.

FAMILY 41. PHILINIDÆ.

Shell usually present, sometimes wanting, internal, bulliform, but slightly spiral, usually not forming a single whorl; it is concealed under the lateral margins of the foot.

1. PHILINE, Asc.

Shell internal, white, translucent, oval, spiral, but only forming a single whorl; spire rudimentary.

1. *Philine sinuata*, Stim. (Fig. 54). Shell minute, ovate, pellucid, longitudinally striate, of about one whorl; aperture very large, dilated in front. White. L. $1\frac{3}{4}$; D. $1\frac{1}{4}$.—Mass.; in 4 fathoms. Many species of this genus, characterized by having a single whorl, are found in deep water.

FAMILY 42. DORIDELLIDÆ.

Represented only by the genus Doridella, Ver. Animal destitute of a shell, oval, smooth, convex; dorsal tentacles retractile, without sheaths; gills tufted, posterior, on the right hand side, in a groove between the mantle and the foot.

1. *Doridella obscura*, Ver. Body broad, oval; foot broad, cordate in front; head disk lunate, hollowed in front, forming tentacle like projections; dorsal tentacles small, stout. Body dark brown, lighter toward the edge; foot and tentacles white. L. 7½; W. 5.—N. J. and north.

Order NUDIBRANCHIATA.

Sea slugs; animal destitute of a shell; mantle sometimes large, usually small or none; gills usually project freely from the dorsal surface; hermaphrodite. These mollusks are found from between tides to great depths.

Family 43. DORIDIDÆ.

Mantle large, without marginal appendages; skin generally very spiculose; dorsal tentacles laminate and retractile within cavities.

* Gills twice pinnate, and not retractile.....*3. Acanthodoris.*
* Gills once pinnate. (A.)
A. Gills retractile into a cavity.....*1. Doris.*
A. Gills not retractile, head with a veil in place of oral tentacles.....*2. Onchidoris.*

1. Doris, L.

Body depressed or sub-convex; skin spiculose; mantle often tuberculate, covering the head and the foot; gills plumose or ramose, united at the base, and retractile with the vent into a common pallial cavity; mouth inferior, usually with two oral tentacles.

1. *Doris tuberculata*, Cuv. (Figs 28). Body oblong-oval, slightly broader in front; gills forming a star of 9, simply pinnate plumes; head very short, crescent-shaped, about the width of the foot, pointed at the sides. Maroon color, darkened on the sides by many dusky points; dark gray below. L. 35; W. 20.—Mass.

2. *Doris repanda*, A. and H. Body broad, depressed; mantle expanded widely beyond the foot; gills forming a star of about 10, small, pinnate plumes; foot narrow, truncated in front. Light colored and covered with minute, white tubercles. L. 15; W. 12. —New Eng.

2. Onchidoris, De Bl.

Body depressed; mantle large; head with a veil in place of

oral tentacles; gills simply pinnate, set in an open circle or ellipse, non-retractile.

* Gill plumes over 15..... *1.*
* Gill plumes only 5..... *2.*
* Gill plumes 6–10..... *3, 4.*

1. *Onchidoris bilamellata*, *L.* Animal oblong-elliptical; surface covered with unequal, short, pestle-shaped papillæ; gills slender, simply pinnate, 20–25 in number, arranged in an oval across the back; several tubercles within the included space. Whitish, varied with rusty brown, or flesh color. L. 25; W. 12.—New England.

2. *Onchidoris grisea*, Stim. Body oval-oblong, quite convex, and semi-globose when contracted; a little pointed behind when fully extended; back covered with short, blunt processes tipped with stellate clusters of spiculæ; gills forming a star of 5 short, yellowish plumes, around a brown spot with a dark bristle in the centre; back plumes much shorter than the front ones; head short, broad, angular. L. 12; W. 8.—Mass.

3. *Onchidoris tenella*, Ag. Body ovate, broadest in front; mantle extending in front much beyond the foot, on the sides but little; gills forming a star of 6 to 7, simple, short plumes, retractile into separate sheaths; foot elliptical-oblong; head short, broader than foot, pointed at the sides, broadly shielded by the mantle. Yellowish-white. L. 13; W. 10.—Mass.

4. *Onchidoris aspersa*, A. and H. Body oblong-elliptical, covered with large, mushroom-like tubercles; gill star of 7 or 8 broad, lanceolate plumes, retractile into separate sheaths; head short, crescentic, about as wide as the foot which is a little narrower than the mantle. Pale cream color, the tubercles lighter, a dusky spot in the centre of the back. L. 12; W. 6—Mass.

3. Acanthodoris, Gray.

Body convex; mantle moderate in size, covered with soft papillæ; oral tentacles united in a veil, with free, flattened, lateral ends; gills united at the base, non-retractile.

1. *Acanthodoris ornata*, Ver. Body elongated, high at the sides, somewhat oblong, narrower and rounded behind, extending much beyond the mantle; mantle narrowed in the middle and covered with small papillæ, except along the centre; lower half of the slender dorsal tentacles smooth, upper half with about 16

strong lamellæ; gills 8, large, bipinnate, the 2 back ones smaller, all united by a web. Yellowish flesh-color, translucent. L. 25; W. 8; dorsal tentacles 6.—

2. *Acanthodoris stellata*. Body broad, oval, wider in front; back convex, covered with numerous, small, scattered, pointed papillæ; gills forming a star of about 7 bipinnate plumes, the subdivisions fine and slender. Color very variable; often purplish-brown sprinkled with yellowish tips; gills purplish at base with yellowish tips, sometimes with star like markings. L. 25; W. 12.—N. Y. and north. Under stones at low water.

Family 44. POLYCERIDÆ.

Gills forming more or less of a circular crown on the middle of the back, surrounding the vent; mantle small or none; skin usually spiculose, our species with dorsal tentacles non retractile.

* Gills once pinnate.....*1. Idalia.*
* Gills twice pinnate. A.
A. Gill plumes 3.....*2. Ancula*
A. Gill plumes 5.....*3. Polycera.*

1. Idalia, Leuc.

Body convex, smooth; mantle small, with long filaments around the edge; head produced in front; dorsal tentacles linear, laminated; gills simply pinnate, non-retractile.

1. *Idalia pulchella*, A. and H. Body ovate; mantle small, produced in front, with four filaments set on an expanded pallial or velar ridge; lateral filaments five on each side, the last large and bifid; dorsal tentacles club-shaped, laminated for three fourths their length; gills 11 (the front one bifid), rather small diminishing backward. L. 10.—New England.

2. Ancula, Lov.

Body slug-form, smooth; mantle very indistinct, near the gills bearing one or more appendages; head produced at the sides into tentacular appendages.

1. *Ancula sulphurea*, Stim. Body slender; dorsal tentacles large, club-shaped, the upper third with about 12 laminæ; gill plumes twice pinnate, three in number, arranged in a half circle, the middle one largest; these are surrounded by 8–12 tentacular processes; foot narrow, rounded at the sides. Very light brownish, transparent; the dorsal tentacles, and the tentacular

processes sulphur yellow at the tips. L. 30.—New Eng. Under stones.

3. Polycera, Cuv.

Body slug-form; mantle indistinct, forming a veil in front and a tuberculated ridge on the sides; gills non-retractile, with two or more lateral appendages.

1. *Polycera Lessonii*, d' Orb. (Fig. 30). Animal slug-shaped: a sharp ridge or fringe along the sides of the back, having 6 tubercles on each side, and making the body quadrate between the tentacles and the gills; another row of tubercles extends along the middle of the back; head with 6 projecting points on each side; gill plumes twice pinnate, 3 large and 2 small. Greenish color formed by green dots; tubercles tipped with sulphur yellow. L. 20–30.—N. Y. and north.

2. *Polycera Emertonii*, Ver. Body small, elongated ovate, somewhat angular,tapering backward to nearly a point, narrowed a little at the neck; dorsal tentacles rather long (length equal width of neck), quite contractile but not retractile; gills three, narrow, elongated, pinnate, subplumose, not finely divided, curved backward, not retractile; the pinnæ few, alternate, generally incurved. Color yellowish-green to olive-green, varied to lemon-yellow and dotted with darker; foot, tentacles, gills and dorsal papillæ lighter greenish-yellow. L. 5–6: W. 1; H. 1½.—New England.

Suborder AIOLOBRANCHIATA.

Branchiæ variable, generally upon the sides of the back; not in a circle surrounding the anal orifice.

Family 45. TRITONIDÆ.

Animal with laminated plumose or papillose gills, arranged along the sides of the back; tentacles retractile into sheaths.

* Four gill lobes projecting above the body, and tufted with gills upon their inner sides.....*1. Scyllæa.*
* Gills very much branching and tree-like.....*2. Dendronotus.*
* Gills simple, club-shaped.....*3. Doto.*

1. Scyllæa, Linn.

Animal elongated, compressed; foot long, narrow, and channeled, adapted for clasping sea weeds; back with two pairs of wing-like, lateral lobes, bearing small, tufted gills on their inner

surfaces; the two tentacles slender, with lamellated ends, retractile into long sheaths.

1. *Scyllæa Edwardsii*, Ver. The four gill lobes, spatulate in shape, extend upward from the back, and have, on their inner surface, small, tufted, branching gills that project beyond their edges; similar gills are also found on the back, and on the tail, which form an upwardly turned lobe; foot very narrow. Color rich brownish-yellow or orange, irregularly spotted with orange brown blotches and white specks and streaks; along each side there is a row of 6 or 7 iridescent, bluish spots. L. 75; W. 12.

2. Dendronotus, Al. and H.

Animal elongated; tentacles laminated; front of the head with branched appendages; gills arborescent, in a single row on each side of the back; foot narrow.

1. *Dendronotus arborescens*, Mu. (Fig. 29). Body elongated, tapering, rounded above, as high as broad, surface somewhat warty; head blunt, with a crown of about six antler-like appendages directed forward; gills in six or more pairs beautifully tree-like, in two rows along the sides of the back, the hind ones smaller. Color very variable, reddish, marbled with brown and opaque white; pale rose color or white and dark brown; gills transparent. L. 50–80.—New Eng. On sea-weed.

3. Doto, Oken.

Animal long, slender; tentacles linear, retractile into trumpet-shaped sheaths; gills ovate, muricated, in a single series on each side of the back; foot very narrow.

1. *Doto coronata*, Gml. Body slender, gradually pointed behind, convex above; tentacles slender; gills ovate-club-shaped, attached by a slender base, arranged in a line of 5–8 on each side. Color variable from colorless to deep brown, the gills covered with dark red dots arranged in circles. L. 12.—New England.

Family 46. ÆOLIDÆ.

Animal with papillose gills arranged along the sides of the body; tentacles subulate, sheathless, non-retractile; branches of the stomach and liver extend into the gills upon the back; skin smooth, without spiculæ; no distinct mantle.

* Animal with no true tentacles; front angles of the head pointed somewhat like tentacles.....*5. Alderia.*

** Animal apparently with only 2 tentacles; small, under 10 long. (A.)

A. With not over 5 large and 7 alternating, small, club-shaped gills on each side.....*6. Stiliger.*

A. Head produced into a flat lobe on each side; gills in a single row of tufts, of 2 or 3 each, on each side.....*8. Embletonia.*

A. Tentacles folded lengthwise; gills apparently like crosses...*7. Hermæa.*

** Animal with 4 tentacles, and, in many cases, the front angles of the foot prolonged into tentacular lobes. (B.)

B. Animal under 10 long; front angles of the foot rounded; dorsal tentacles longer. (C.)

C. Foot rudimentary, branchiæ in a single row on each side, each with a sucker-like extremity.....*9. Tergipes.*

C. Anterior angles of foot rounded; branchiæ in distant transverse rows.....*10. Galvina.*

B. Over 10 long. (D.)

D. Width of body ⅓–½ the length .....*1. Æolis*

D Width of body ⅛–⅓ the length. (E.)

E. Tentacles about equal in length; dorsal ones perfoliate.....*3. Flabellina.*

E. Tentacles usually unequal; dorsal ones simple. (F.)

F. Front angles of the foot not much prolonged, sometimes rounded.....*2. Æolidia.*

F. Front angles produced into long, tentacular lobes..*4. Coryphella.*

1. Æolis, Cuv.

Animal ovate; dorsal tentacles smooth, oval, slender; gills simple, cylindrical, numerous, depressed, and imbricated; foot narrow.

1. *Æolis papillosa*, L. Body broad, depressed, truncate in front, rapidly tapering behind; dorsal tentacles dark, of the same length as the gills; oral tentacles longer, more slender, and lighter in color; gills lanceolate, compressed, short-stalked, arranged in many (12–20) imbricated, oblique rows on each side of the back, and with 10–12 in each row; central portion of the back nearly naked, variously mottled, and showing the large sack containing the pulsating heart. L. 30–70; W. ⅓ length.—New Eng. Under stones between tides.

2. *Æolis salmonacea*, Cout. Body oblong, broad; tail suddenly tapering to an acute point; tentacles large and blunt, the dorsal ones minutely serrated at the sides; gills rather long, larger and pointed, 100 or more on each side, arranged in crowded, regularly spaced series, orange red in color; foot broad, the front angles

prolonged into small tentacular appendages. Color yellowish-white. L. 40; W. 20.—Mass.

2. Æolidia, Cuv.

Dorsal tentacles simple; gills compressed, in transverse, rather distant rows; front angles of the foot almost rounded.

1. *Æolidia picta*, A. and H. Oral tentacles short and stout; dorsal ones twice as long, simple, with an amber ring at the outer third; gills inflated like an olive jar, arranged along the sides in 6–8 series, the front one being somewhat clustered and the rest set upon oblique ridges; foot narrow, with the front angles rounded. Animal yellowish-white, sparsely dotted with brownish blotches and white dots; gills with a darkish pith, a white tip, and a yellowish ring below the tip. L. 12–20; W. 3–5.—Mass.

2. *Æolidia diversa*, Cout. Body lanceolate, gradually tapering to a fine point; oral tentacles long and slender; dorsal ones shorter, smooth; gills somewhat fusiform, quite slender at base, arranged in a crowded, rather irregular manner, along the sides in transverse series of three or four; front angles of foot neither rounded nor tentaculate. Pale straw-color, tinted reddish by the viscera within; gills, outside, without color, inside, deep orange. L. 30; W. 8.—New Eng.

3. *Æolidia pilata*, Gld. (Fig. 27). Tentacles about equal; dorsal ones smooth; gills rather stout, fusiform, arranged in five or more remote groups along each side; each group composed of two approximate ranges; the first with about 8 in each range, the next two, about 6, and the next 5; angles of foot triangular. Pale drab color, edged above with light fawn color; along the back there is an interrupted, elongated stripe of carmine margined with silvery dots; gills with a white ring, a clear ring, and a white tip. L. 38; W. 6.—Mass.

3. Flabellina, Cuv.

Body slender; dorsal tentacles perfoliate; oral tentacles elongated; gills on compressed stalks; foot angularly produced in front.

1. *Flabellina Bostoniensis*, Cout. Body lanceolate, rounded above; gills cimeter-shaped, arranged in five or more distinct groups on each side; the front group has 16 arranged in cubic

quincunx; these gills curve backward and inward, forming arches over the back: tentacles about equal in length; foot with the front angles prolonged into large tentacular appendages. Drab-colored, with white or silvery lines on tail, back of oral tentacles and tips of gills. L. 25; W. 7.—Mass.

2. *Flabellina rufibranchialis*. Johnst. Body slender, gradually tapering; tentacles about equal, long and slender; gills slender almost linear, arranged in 6 or 7 clusters on each side, each cluster having from 2–6 rows of 4 each; anterior angles of foot prolonged. Body watery-white, with an opaque line on the back; interior of gills bright vermilion, with an opaque white ring near the tip. L. 25–36; W. 4–6.—New Eng.

4. Coryphella, Gray.

Upper tentacles simple; angles of foot produced; middle part of jaw denticulated.

1. *Coryphella rutilla*, Ver. Foot broad, pointed; front angles of the foot very long; head small, rounded, often notched in front; mouth large, nearly terminal; gills numerous, long, slender, slightly fusiform, arranged in 8 or 10, usually well separated, transverse clusters, mostly of 2 rows each, 6–8 in each row, clusters crowded in front. Color yellowish-white, translucent; dorsal tentacles pale yellowish, usually tufted with white; gills with vermilion nucleus, the tips flake-white. L. 48; W. 7; dorsal tentacles 10; oral 9; gills 9½.

2. *Coryphella gymnota*, Cout. Body slender and tapering to a fine point; head small, rounded, and with a distinct neck; tentacles four, the oral ones rather longer, and the dorsal ones with very fine wrinkles at the sides: gills club-shaped, short, arranged in 7 clusters of about 5 each, on each side. Pale, watery-drab color; gills transparent, but filled with reddish-brown dots. L. 25; W. 2½.—Mass. On sea weeds.

3. *Coryphella Stimpsonii*, Ver. Foot broad; auricles small, short, triangular, often directed backward; head large, broad, rounded in front, with distinct, rounded lateral lobes; tentacles slender: branchiæ numerous, crowded, fusiform. Color yellowish-white with a flake-white line on the upper side of foot: tentacles tinged with salmon and specked with white; branchiæ with salmon, yellowish to reddish-brown nucleus and specked at the

tips with white which sometimes forms a ring. L. 10–32. Mass. Bay and northward.

4. *Coryphella Manamensis*, Stim. Foot auricled, not very broad; tentacles rather thick, dorsal ones wrinkled; branchiæ slender, irregular, and variable in length, arranged in clusters along the sides. Color of body pale white; dorsal tentacles brownish with pale tips looking as if hollow, oral ones with white specks along the outer edge; branchiæ bright vermilion with a ring of flake-white at the tips. L.35—New England.

5. Alderia, All.

Animal oblong, without tentacles; head lobed at the sides; gills arranged down the sides of the back.

1. *Alderia Harvardiensis*, Ag. Animal square in front, broad, lanceolate behind; true tentacles none, but the lateral prolongations of the head triangular and tentacular-like; gills short, club-shaped, arranged in 6 or 7 clusters on each side, 2—a longer and a shorter one—in each cluster; foot twice as broad as the body, so that, by rolling the edges upward, the gills are partially covered. Ochreous brown; foot yellow. L. 12; W. 4.—Mass. In shallow pools of salt or brackish water.

6. Stiliger, Ehr.

Foot rounded in front; dorsal tentacles simple; oral tentacles tuberculiform; gills club-shaped.

1. *Stiliger fuscata*, Gld. Animal terete, gradually tapering to a fine point behind; head not distinct, notched in front; the dorsal tentacles long and slender; the oral ones mere bulgings on the head; gills long, club-shaped, quite slender at base; an upper row of four, on each side, begins $\frac{1}{3}$ along the body from the front, growing shorter towards the tail, and a lower series of 5 or 6 smaller ones arranged alternately with the upper ones; dark slate colored above; foot pale ochreous; gills black with white at both ends. L. 8; W. 1; Ten. 2; Br. $1\frac{1}{2}$.—Mass. On timbers.

7. Hermæa, Lov.

Animal elongated; tentacles folded longitudinally; gills numerous, arranged down the sides of the back.

1. *Hermæa crasiata*, Ag. Body very slender; foot narrower than the body; obtusely dilated at the front angles; head small,

semicircular; tentacles two, dilated and obtusely pointed; gills dilated at the centre, and with the dark centres appearing like rude crosses, whence the name; about 7 principal ones on each side and 8–10 intermediate, much smaller ones. L. ; W. .—Mass.

8. Embletonia, A. and H.

Animal slender; tentacles two, simple; head produced into a flat lobe on each side; gills simple, subcylindrical, in a single row down each side of the back.

1. *Embletonia fuscata*, Gld. Animal terete, tapering to a short, pointed tail; head large, angles rounded, slightly notched in front; the two tentacles short, linear, capable of corrugations; gills club-shaped, arcuate, arranged in 5 or 6 tufts on each side; 2 or 3 front tufts contain 3 each, and the others 2, very unequal in size; foot angles not dilated. Pale drab to slate color, more or less dotted. L. 4; W. $\frac{2}{5}$.—Mass. On timbers.

2. *Embletonia remigata*, Gld. Similar to the last, but larger, lighter in color, and with longer gills. Color uniform pale yellow; the gills wax-yellow dotted with greenish, and having a pale olive centre. L. 6; W. 1.—Mass. On sea weed.

Family 47. ELYSIIDÆ.

Animal with no distinct breathing organs; respiration performed by the ciliated surface of the body.

* Wing-like expansions along the sides of the body.....*1. Elysia.*
* No wing-like expansions.....*2. Limapontia.*

1. Elysia, Risso.

Animal elliptical, depressed, with wing-like lateral expansions; tentacles simple, with sessile eyes between them; foot narrow.

1. *Elysia chlorotica*, Ag. Body slender, tapering, with broad, wing-like expansions which fold over the back and overlap while the animal is crawling; when expanded, as in swimming, the animal has a leaf-like look; head and neck distinct, with two lanceolate, folded tentacles. Emerald green, finely dotted with white and red dots. L. 25–40; W. when folded, $\frac{1}{3}$ length, when expanded, $\frac{3}{4}$ length.—Mass., in brackish water.

2. *Elysia catulus*, Ag. (Fig. 26). Body ovate-lanceolate, with the lateral expansions $\frac{2}{3}$ its length, and not meeting when folded; head large, rounded, globose; tentacles two, short, blunt, broad;

back covered by longitudinal folds. Brownish sea-green, with several whitish lines and spots. L. 6; W. 2, when folded.—Mass.

2. Limapontia, Joht.

Animal minute, leach-like; head truncated in front, with eyes on arched, lateral ridges; foot linear.

1. *Limapontia zonata*, Gir. Body depressed, without the lateral wing-like expansions, thus its appearance is like that of the land slugs; mantle distinct; head somewhat separated from the body, and with crest-like ridges on the sides; eyes large, sessile, on the back of the head, in pale, circular spaces. Pale reddish color, with transverse bands of white. Minute, hardly 2 long.—Mass.

Order PULMONATA.

This division includes all the land and fresh water mollusks which breathe air. The few species included in this work live on the mud flats near shore, sometimes below high water mark, and so, in a sense, may be considered marine. The breathing organ, in the form of an air sack, or dorsal cavity lined with a vascular network, is placed in front of the heart. All belong to the suborder Basommatophora which have eyes at the bases of the two flattened, triangular or subcylindrical, contractile but not invertible tentacles; no operculum.

Family 48. AURICULIDÆ.

Shell spiral, solid, usually thick; spire elevated; aperture usually elongated, contracted by teeth. Animal with the foot elongated, pointed; sessile eyes at the inner bases of the tentacles; head extended beyond the tentacles with more or less of a rounded, two lobed snout; hermaphrodite.

* Shell over 6 long; inhabiting the seashore between tides. (A).

A. Aperture about ½ the length of the shell.....*1. Alexia.*

A. Aperture more than ½ the length.....*2. Melampus.*

1. Alexia, Gray.

Shell oblong-oval, thin; spire acuminate; last whorl large, rounded at base; columella with an oblique plait; aperture contracted by teeth.

1. *Alexia myosotis*, Drap. Elongated ovate, thin, smooth, shining, with acute apex; whorls slightly convex; the last ¾ of the whole length; aperture long and narrow, acute above; lip thin

slightly reflected over the minute, perforated umbilicus; on the inner lip, the adult shell has 3 white folds or teeth, the lower one formed by the turning of the lip within the aperture, the second one thin, transverse and prominent, the third minute. Dark horn color, the suture narrowly banded with red. Animal light drab, head and tentacles darker; foot ½ as long and wide as the shell. L. 8; D. 3½; An. 40; Wh. 7–8; Ap. ½.—Whole coast; common on wood and stones between tides.

2. Melampus, Montf.

Shell suboval, solid; spire rather short; aperture long and narrow; columella with several plications; outer lip internally plicate.

1. *Melampus lineatus*, Say. (Figs. 46 to 48). Shell imperforate, elliptically obovate, rather thin, shining when perfect, usually much eroded; spire short, obtuse; surface longitudinally wrinkled, and marked with minute revolving lines; upper whorls flattened, aperture long, narrow, slowly widening below; lip thin and sharp; inner lip covered with a thin, shining enamel, and furnished with two fold-like teeth; within the outer lip there are usually 1–4 ridges not reaching to the edge. Horn color, or brownish, sometimes with reddish revolving bands. Animal reddish-brown above, paler below; foot as long and wide as the shell. L. 11; D. 6; An. 80°; Wh. 5–6; Ap. ¾.—Whole coast. Common on marshes sometimes overflowed by the tide.

2. *Melampus bidentatus*, Mont. May possibly be found on the coast. It is a smaller shell with the aperture much shorter in proportion and the spire more acute. L. 7; D. 3; An. 40°; Wh. 6; Ap. ⅔.

Order CTENOBRANCHIATA.

Mollusks with comb-form branchiæ; that is, composed of leaflets arranged like the teeth of a comb, and situated in a cavity having an external opening upon the side of the neck. Sexes in different individuals (dicœcious). Shell spiral.

Family 49. TEREBRIDÆ.

Represented only by the genus:—

1. Terebra, Brug.

Shell long, narrow, many-whorled; aperture deeply notched in front, and no true columellar plaits; operculum annular, horny,

with apical nucleus. Animal has a foot rounded in front, angulated behind; head large, with short, small tentacles; eyes at or near the tips of the tentacles, or wanting; between the tentacles extends a rather long, cylindrical trunk.

1. *Terebra dislocata*, Say. Shell polished, attenuated; whorls flat, with 15–18 ribs to each, which are dislocated or interrupted above, near the suture, by a revolving groove as deep as the suture; numerous, minute, impressed, revolving lines also on the whorls. Color chocolate brown, with a pale, revolving band; ribs white. L. 44; D. 8; An. 17°; Wh. 13; Ap. ¼—Md. and south.

Family 50. PLEUROTOMIDÆ.

Shell fusiform; aperture with a canal at the anterior end and a notch at the posterior end near the suture. Operculum often absent, if present horny and annular. Animal with tentacles wide apart, the eyes at the outer bases.

* Shell with operculum.....*1. Bela.*
* Shell without operculum.....*2. Mangilia.*

1. Bela, Gray.

Shell oval, fusiform, thin; spire produced; canal short; notch small, near the suture; columella flattened; operculum pointed at both ends.

1. *Bela harpularia*, Cout. Shell ovate-oblong; whorls round and shouldered, with about 18 oblique, rounded ribs, crossed by fine revolving lines; ribs disappearing on the lower part of body whorl; aperture narrow, outer lip sharp, inner lip white, smooth; canal very short. Brownish flesh color. L. 16; D. 8; An. 35°; Wh. 6–8; Ap. ⅔.—N. Y. and north.

2. Mangilia, Risso.

Shell fusiform, mostly longitudinally ribbed; spire elongated, turriculated, acuminated; canal short, more or less truncated; columella smooth; sinus near the suture. No operculum.

1. *Mangilia plicosa*, C. B. Adams. Shell small, elongated-ovate, somewhat turreted; lower whorl two thirds the length of the shell, with about 12, somewhat oblique rib-like folds crossed by 10 or more elevated revolving threads; aperture narrow; outer lip greatly thickened by one of the ribs; the notch at the posterior part deep, distinct, smooth. Ashy-white color. L. 6; D. 3; An. 45°; Wh. 6; Ap. ½ nearly.—Cape Cod and south.

2. *Mangilia bicarinata*, Cout. Shell tapering about equally at both ends; whorls convex, with numerous distinct revolving lines, and, between them smaller ones; about the middle of the whorl, there is a deep groove with a prominent line on each side; aperture narrow, elliptical, with a slight notch at the posterior end; outer lip thin, toothed by the revolving lines. Whitish slate-color, or dusky brown. L. 10; D. 5; An. 40°; Wh. 6; Ap. $\frac{2}{3}$.—Arctic Seas to N. J.

3. *Mangilia cerina*, Kurtz & Stim. Shell fusiformly turreted, with about 10 elevated ribs, and numerous, revolving striæ; aperture oblong; lip sharp with a decided angle and notch at the posterior fourth. Waxy or ashy. L. $6\frac{1}{2}$; D. $2\frac{1}{2}$; An. 25°; Wh. 7; Ap. $\frac{1}{3}$.—Cape Cod and south. Rare.

Family 51. FASCIOLARIDÆ.

Shell spindle or pear-shaped; spire acute; aperture elongated-oval, with a moderate to long, open, straight canal; columella smooth or very slightly folded Animal rather small, retractile to about a third of a whorl from the aperture.

1. Fulgur, Montf.

Shell pear-shaped, rather thin, the whorls angulated and spinous or nodulous; body whorl large, attenuated below into a long, twisted canal. Animal rather small, retractile, with its operculum, far within the aperture.

1. *Fulgur canaliculatus*, L. Shell large, pear-shaped, covered with revolving lines, and a hairy epidermis; whorls shouldered, outer edge nodular, and a broad canal at the suture. L. 150; D. 80; An. 90°; Wh. 6; Ap. $\frac{3}{4}$; canal $\frac{2}{3}$ of Ap.—Mass. and south. Very common.

2. *Fulgur carica*, Gml. Shell large, solid, pear-shaped; whorls flattened at the summit, and the angle raised into a series of compressed tubercles, about 9 in number, on each revolution. L. 150; D. 75; An. 85°; Wh. 6; Ap. $\frac{4}{5}$; canal $\frac{2}{3}$ of Ap. Mass and south. Common.

3. *Fulgur perversa*, L. Shell much like the last but reversed, forming a sinistral shell. It grows to the length of over 300. Its northern limit is about Cape Hatteras.

Family 52. BUCCINIDÆ.

Shell ovate to pear-shaped, rather thin; spire elevated; canal

moderate and twisted; columella smooth; operculum ovate, nucleus near the edge.

* Canal very short.....*1. Buccinum.*
* Canal about one third of aperture.....*2. Sipho.*

1. Buccinum, L.

Shell ovate or oblong, covered with a horny epidermis; spire elevated, apex acute; aperture large, oval, with a wide and very short, anterior canal; lips smooth internally.

1. *Buccinum undatum*, L. Shell thick, ovate-conic, ventricose, with 12 or 13, obliquely-waved, elevated ribs, and many revolving raised lines; whorls regularly convex; minute striæ extend some distance within the oval aperture, and form crenulations on the outer lip. Epidermis velvety, yellowish-brown, aperture golden yellow. L. 60; D. 35; An. 65°; Wh. 6; Ap. $\frac{1}{2}$; canal very short.—N. J. and north. Quite common north of Cape Cod.

2. Sipho, Klein.

Shell pear-shaped; whorls rounded, usually smooth, never tuberculate or spiny; spire moderate; canal produced and recurved.

1. *Sipho Stimpsoni*, Mörch. (Figs. 32, 33). Shell elongated, symmetrically fusiform; spire attenuated to the apex; whorls slightly convex; body whorl covered with 40–50, small, revolving ridges; near the outer lip, these give place to vertical, sinuous striæ; aperture oblong ovate. Epidermis horn brown, inside pearly-white. Animal white, with irregular black spots. L. 70; D. 27; An. 50°; Wh. 8; Ap. over $\frac{1}{2}$; canal $\frac{1}{3}$ of Ap.—Mass. and north. A deep water shell, occasionally thrown on the beach.

2. *Sipho pygmæus*, Gld. Shell same shape and markings as above. Animal pure white. L. 25; D. 11; An. 38°; Wh. 6; Ap. $\frac{2}{5}$; canal $\frac{1}{3}$ of Ap.—Mass. and north. Deep water.

Family 53. NASSIDÆ.

Shell ovate, spire usually elongated; aperture with a notch or a short recurved canal; inner lip usually callous; operculum horny, with nucleus at one end. Animal with two tails at the posterior extremity.

Nassa, Lam.

Shell ovate; aperture ovate with a short, recurved, truncated, anterior canal; inner lip smooth; outer lip dentated, and internal-

ly crenulated with a few small teeth at some distance from the edge. Animal with a broad head, and a foot notched behind, and often prolonged into two subulate tails. These animals are very active, and not at all shy when kept in confinement.

1. *Nassa obsoleta*, Say. (Fig. 45). Shell solid; apex eroded; spire short; whorls flattened convex; surface covered with numerous, unequal revolving lines which are crossed by numerous oblique folds, giving the surface, when the greenish, mould-like plants are removed, a reticulated appearance. Dark reddish-brown, purplish within. Animal mottled with slate-color; foot equal to the shell in length. L. 25; D. 12; An. 55°; Wh. 6; Ap. $\frac{1}{2}$.—Whole coast. Very abundant on mud flats.

2. *Nassa trivittata*, Say. (Fig. 36). Spire elevated, acute; whorls flattened, and with a conspicuous shoulder at the suture; whole surface covered with a network of granules formed by revolving lines and ribs; about 10 revolving lines on the body whorl. Greenish or yellowish-white, sometimes banded on body whorl. Animal whitish, sparsely dotted with pale lilac. L. 18; D. 8; An. 45°; Wh. 7; Ap. $\frac{2}{3}$.—Whole coast. Common.

3. *Nassa vibex*, Say. Shell thick, ovate-conic; spire short, acute; body whorl with from 10–12 undulating ribs which are continued to the apex, and about the same number of revolving lines which are most distinct on the ribs; outer lip thickened and with 2–5 teeth within; pillar very concave, and with much callus. Color ashy-white to pale reddish-brown, with darker revolving bands. Animal about $\frac{1}{2}$ longer than shell, light colored, and mottled. L. 13; D. 8; An. 67°; Wh. 6; Ap. $\frac{2}{3}$.—Cape Cod and south. Rather rare.

Family 54. COLUMBELLIDÆ.

Shell oval, covered with an epidermis; spire generally short; aperture narrow, elongated, ending in a very short anterior canal, inner lip usually dentate; outer lip generally thick. Animal with a large flattened head; foot narrow; operculum very small.

1. Columbella, Lam.

Shell elongated; aperture narrow, with a short, anterior canal; inner lip, crenulated to smooth; outer lip inflected, internally thickened, and somewhat crenulated.

1. *Columbella avara*, Say. Shell fusiform, widest but little be-

low the middle; spire acute; whorls flattened, the first three smooth, the last, with 10–15, smooth, obtusely rounded ribs, separated by wider, concave spaces, and covered by revolving striæ; these ribs gradually disappear below the middle where they are replaced by many, deep revolving grooves. L. 12; D. 5½; An. 36°; Wh. 9–10; Ap. ⅔.—Mass. and south. More abundant south.

2. *Columbella lunata*, Say. Shell ovate-conic; whorls slightly convex; suture shallow; surface smooth, except a single, revolving line below the suture, and a few around the base; aperture oval, outer lip toothed within. Color reddish-brown, with two rows of crescent-shaped, whitish spots on the whorls; outer lip dark-brown. L. 5; D. 2½; An. 43°; Wh. 6; Ap. ⅔.—Mass. and south. Common south of Cape Cod.

3. *Columbella rosacea*, Gld. Shell acutely conic, covered with minute, revolving lines; lip sharp and without teeth. White, tinged with rose. L. 7; D. 3; An. 35°; Wh. 6; Ap. ⅔.—New England. In rather deep water.

Family 55. MURICIDÆ.

Shell turreted, with an anterior canal; the whorls thickened by longitudinal ribs or nodules at each rest period in its growth. Operculum with marginal nucleus.

* Whorls rounded. (A.)
  A. Longitudinal ribs very distinct.....*1. Urosalpinx.*
  A. Revolving furrows very distinct.....*3. Purpura.*
* Whorls angulated.....*2. Eupleura.*

1. Urosalpinx, Stim.

Shell elongated oval, with about 10 rounded, longitudinal ribs; canal short, broad.

1. *Urosalpinx cinerea*, Say. (Fig. 35). Shell oval; fusiform, with convex whorls, crossed by about 12 rib-like undulations, and with numerous, revolving lines; aperture oval, outer lip sharp; canal short. Color reddish-brown, covered with ashy-gray pigment, brownish within. L. 25; D. 15; An. 50°; Wh. 5–6; Ap. ½; canal nearly ⅓ Ap.—Whole coast. Common on rocks, especially southward.

2. Eupleura, Adams.

Shell elongated, with about 10 longitudinal ridges or varices; aperture oval, with a long, narrow, straight, anterior canal.

1. *Eupleura caudata*, Say. (Fig. 37). Shell solid, with angulated whorls traversed by 11 stout ribs crossed by numerous revolving lines; lip thick, bordered within by raised granules; canal long, straight, narrow. Reddish-brown, white, or bluish within; operculum chestnut. Animal nearly white; foot yellow. L. 25; D. 15; An. 60°; Wh. 5; Ap. $\frac{3}{5}$; canal $\frac{1}{2}$ Ap.—Mass. and south.

3. Purpura, Brug.

Shell oblong-oval, last whorl large; spire short; aperture large, with a very short, oblique canal or notch; columella flattened.

1. *Purpura lapillus*, L. (Fig. 34). Shell thick and solid, ovate; spire short, acute; whorls covered with deep, revolving furrows and ridges, usually crossed by raised, scale-like wrinkles of growth; lip arched, and subacute, with obscure, revolving ridges within the margin. Color varies from white and yellow to dark-red, often banded. Animal white. L. 25–30; D. 14–17; An. 60°–90°; Wh. 5–6; Ap. $\frac{2}{3}$–$\frac{4}{7}$.—Whole coast. Local south of Cape Cod; abundant north.

Family 56. SCALARIDÆ.

A small family of mainly the one genus:—

1. Scala, Humph.

Shell usually pure white and lustrous, turreted, many whorled; whorls round, ornamented with numerous raised, longitudinal ribs; aperture round; peristome continuous; operculum horny, few-whorled.

Animal with a retractile, proboscis-like mouth; tentacles close together, long and pointed, with the eyes at their outer bases. Animal exudes a purple fluid when molested.

* Species of large size over 15 long, with 8–15 ribs.....*1–3.*
* Species under 15 long, with 15–20 ribs.....*4, 5.*

1. *Scala Sayana*, Dall. Shell long conic; whorls in contact and crossed by 9 well marked ribs which are continuous to the apex; spaces between polished, smooth; anterior margin of lip rounded. White with a smooth translucent, pale-brown nucleus of about 3 whorls. L. 16; D. 6; An. 25°; Wh. 9; Ap. $\frac{1}{5}$.—Va. and south.

2. *Scala angulata*, Say. Shell conic, turreted; whorls touching each other only by the ribs; ribs 9 to each whorl, prominent,

simple, oblique; no umbilicus. White. L. 15–20; D. 6–8; An. 33°; Wh. 6–11; Ap. ¼.—Conn. and south. Rare north of New Jersey.

3. *Scala Grœnlandica*, Perry. Shell with whorls touching and having 8–15 stout, oblique ribs, with intervening, coarse ridges, and 7 or 8 revolving lines; the ribs do not end abruptly at the suture, but extend from whorl to whorl. Aperture bordered by a rib which is notched at the base; no umbilicus. L. 25; D. 9; An. 35°; Wh. 10; Ap. ¼—Cape Cod and north. Common north.

4. *Scala lineata*, Say. Shell long-conic, pointed, with 17–19, obtuse, stout, little elevated ribs on the body whorl, the ribs continued on the other whorls; the body whorl also has a raised, revolving line above a reddish-brown band; no umbilicus; whorls touching. White, tinged with brownish. L. 12; D. 5; An. 36°; Wh. 8; Ap. ⅓.—Whole extent. Rather common south.

5. *Scala multistriata*, Say. Shell conic; apex pointed; whorls in contact; body whorl with about 16, regular, simple, moderately elevated ribs; spaces with numerous, impressed, revolving lines; no umbilicus. White; nucleus pale, glassy, few whorled. L. 13; D. 5; An. 30°; Wh. 8; Ap. ¼.—Mass. and south.

Family 57. PYRAMIDELLIDÆ.

Shell white, slender, elongated, many whorled, mostly longitudinally ribbed or spirally striate; operculum horny, subspiral.

* Columella without a fold.....*1. Turbonilla.*
* Columella with an oblique fold. (A.)
A. Whorls not spirally grooved.....*2. Syrnola.*
A. Whorls with 1–15 revolving lines or grooves.....*3. Odostomia.*

1. Turbonilla, Risso.

Shell slender, many whorled; whorls plaited; apex sinistral; aperture simple, ovate; peristome incomplete; columella not plaited. Most of the species of Turbonilla are deep water shells, and are not here described as they are found only by dredging, and in the stomachs of fishes.

1. *Turbonilla interrupta*, Tot. Shell small, slender; whorls almost flat, with 20–30 obtuse ribs crossed by about 14—apparently 7—revolving lines interrupted by the ribs; a slight shoulder on the whorls makes the suture distinct; aperture ovate, angular above. Whitish-brown or amber-colored, glossy.

L. 8; D. 3; An. 12°; Wh. 10; Ap. ¼.—Mass. and south. Not rare.

2. *Turbonilla elegans*, Ver. Shell elongated, slender acute; whorls well rounded; suture rather deep; surface somewhat shining with numerous longitudinal ribs which are not oblique, and fine revolving grooves interrupted by the ribs; the lower half of the body-whorl has only the revolving lines; aperture broad oval; outer lip thin, sharp. Epidermis thin, light-yellow. L. 9; D. 2½; An. 18; Wh. 10; Ap. ¼.—Mass. and south.

2. Syrnola, A. Ad.

Shell subulate, straight, virteous, banded, polished; whorls flat; suture impressed; aperture oblong, inner lip obliquely plicate in the middle.

1. *Syrnola producta*, C. B. Ad. Shell conic-cylindrical; whorls nearly flat; tip blunted, as if one or more whorls were removed; columella flexuous; no umbilicus. Epidermis light-brown. L. 6; D. 1¾; An. 12°; Wh. 8 or more; Ap. ¼.—Mass. to N. J.

2. *Syrnola fusca*, C. B. Ad. Shell subelongated, conical, thin and horny; spire obtuse; whorls slightly convex; suture strongly impressed; aperture broad, acutely angular above, and dilated in the middle; fold on the pillar lip far within, or obsolete; an umbilical indentation about the middle of the inner lip. Epidermis shining-brown. L. 6; D. 1¾; An. 25°; Wh. 6; Ap. ⅓. —Cape Cod to N. J.

3. Odostomia, Flemg.

Shell conical elongated; aperture ovate; lips disunited posteriorly, and sometimes produced in front; pillar with a tooth-like fold. Operculum horny, indented on the inner side.

1. *Odostomia bisuturalis*, Say. Shell ovate-conical, apex rather obtuse; whorls flattened, with almost always an impressed line revolving below the suture, making it appear double; columella with an obtuse fold. Surface smooth, light-green under a brownish epidermis. L. 5; D. 2½; An. 35°; Wh. 5–6; Ap. ⅓.—Mass. to N. J. Common under stones at low water.

2. *Odostomia trifida*, Tot. Shell acutely pointed, smooth and glossy; whorls flat, with about 6 impressed, revolving lines; the one above and the next two below the suture much more distinct, making three characteristic lines at the suture; pillar lip

with a single, sharp, oblique fold. Ivory or soiled white. L. 5; D. 2; An. 23°; Wh. 8; Ap. $\frac{1}{3}$—New Jersey and north. Common under rocks and stones.

3. *Odostomia seminuda*, C. B. Ad. Shell acute-conic, with coarse, revolving lines crossed by longitudinal ones, giving the surface a granulated appearance, except the lower half of body-whorl, which has only revolving lines; outer lip thin and scalloped by the revolving lines. Glossy white, translucent. L. 4; D. 2; An. 30°; Wh. 6–7; Ap. $\frac{1}{3}$.—Mass. and south. Common.

4. *Odostomia impressa*, Say. Body whorl with ten deeply sculptured, revolving lines on the lower half, and five distinct, revolving lines on the upper half; about four on the next whorl, and less on the rest; aperture ovate, acute above, effuse below. Soiled-white, the lines rufous. L. 5; D. $1\frac{3}{4}$; An. 24°; Wh. 6; Ap. $\frac{1}{3}$.—Cape Cod and south.

Family 58. TRIFORIDÆ.

A small family of elongated, turreted sinistral shells represented by the genus:—

1. Triforis, Desh.

Shell similar in form and sculpture to the Cerithiidæ, but sinistral.

Animal with tentacles club-shaped at the tips and united at their bases by a sinuated veil.

Triforis perversa, L. var. *nigrocincta*, Ad. Shell conic-cylindrical, with three revolving series of granules; whorls reversed; canal twisted, about $\frac{1}{3}$ as long as the aperture; reddish black; columella black; a black, spiral belt in faded shells. L. 7; D. $1\frac{3}{4}$; An. 23°; Wh. 12; Ap. $\frac{1}{3}$.—Mass. and south.

Family 59. CERITHIOPSIDÆ.

Shell spiral, elongated, many whorled, frequently with many longitudinal ribs; aperture with an anterior canal and a less distinct posterior one; lip generally expanded in the adult; operculum horny and spiral. Animal with a retractile proboscis.

1. Seila, A. Adams.

Shell elongated, turreted, many whorled; aperture small with a crooked canal in front; whorls flattened and granular, with rounded nodules formed by ridges of growth and spiral lines crossing each other; operculum subtriangular. Animal with

short stout tentacles and eyes on their outer bases; foot very short, indented in front and rounded behind.

1. *Seila terebralis*, C. B. Ad. Shell long, conical; whorls flattened, with 3 or 4 revolving ridges on each, and numerous, fine, longitudinal lines between them; aperture oval; base abrupt. Reddish-brown. L. 12; D. 3; An. 18°; Wh. 10–12; Ap. ⅓.—Mass.

2. Cerithiopsis, Forbes and Hanly.

Shell nearly as in Seila; operculum paucispiral, somewhat concave, smooth outside, of 3 or 4 whorls. Animal with foot and tentacles much more elongated than in Seila.

1. *Cerithiopsis Greenii*, C. B. Ad. Shell conic-cylindrical, with 20–25, slightly elevated ribs on the body whorl, and crossed by 3, revolving, impressed lines on nearly all the whorls, forming three series of granules; aperture nearly circular; canal short and deep. Reddish-black. L. 5; D. 1¼; An. 30°; Wh. 10–12; Ap. ⅓. Mass. and south.

2. *Cerithiopsis subulata*, Montagu. Shell long, conical; whorls flat, each with three rows of granules; suture very deeply impressed; aperture subquadrate; canal less than ½ the length of the aperture, columella twisted. Color dark reddish-brown. Animal with a long, small foot, truncate in front, and notched behind; very light colored, with flecks of opaque white. L. 13; D. 3; An. 20°; Wh. 17; Ap. ⅙.—New England.

Family 60. CERITHIIDÆ.

Shells very similar to those of the preceeding family, but the proboscis of the animal is only contractile instead of being retractile.

1. Bittium, Leach.

Shell elevated, with numerous granulated whorls and irregular varices; anterior canal short and not recurved; outer lip not recurved; operculum 4 whorled.

1. *Bittium alternatum*, Say. Shell acute, conic, thin; whorls with a distinct shoulder formed by a series of granules; surface granular from the crossing of slightly elevated ribs and spiral lines; the ribs, about 20 in number, disappear on the lower half of the body-whorl, leaving there about 6, elevated, revolving lines; suture deeply impressed; lip sharp, modified by the re-

volving lines. Bluish to reddish-black. L. 6; D. 2; An. 28°; Wh. 7; Ap. $\frac{1}{4}$.—Mass. Bay to Sandy Hook.

2. *Bittium varium*, Pfr. Shell very similar to the last, but growing larger south of Cape Hatteras; takes the place of it from Md. and south.

Family 61. CÆCIDÆ.

A small family of the one genus:—

1. Cæcum, Flemg.

Young shell spiral in one plane, afterwards, a curved tube closed by a convex partition where the spiral portion has been lost. Animal with a long, flat rostrum, and sessile eyes behind the short tentacles; foot short, narrow.

1. *Cæcum pulchellum*, Stim. Shell tubular, slightly curved, contracted at both extremities, with about 25 rounded rings. L. $2\frac{1}{2}$; D. $\frac{1}{2}$.—Mass. and south.

2. *Cæcum Cooperi*, Smith. Shell tubular, slightly curved, with about 12 longitudinal, elevated lines; the spaces between are wider than the lines and have transverse grooves. L. 3; D. $\frac{2}{3}$.—Mass. and south. Rare.

Family 62. VERMETIDÆ.

Shell tubular, attached, sometimes regularly spiral when young, always irregular when adult; aperture round. Animal with rudimentary foot and long head.

1. Vermetus, Adanson.

Shell irregularly spiral or contorted, tubular, free or attached on one side; operculated.

1. *Vermetus radicula*, Stim. Shell regularly spiral when young, irregularly tubular in its later growth, with numerous, unequal, raised lines extending its entire length; the spiral portion has about 8 whorls (this part 12 long) the rest of the shell may extend 200. Animal with rudimentary foot, long head, and retractile proboscis. Animal light-brown spotted with black.—Mass. and south. Not rare south.

Family 63. LITTORINIDÆ.

Shell spiral, top-shaped or globular; lip not notched; interior not pearly; operculum horny, spiral or slightly so. Animals inhabiting salt, brakish or fresh water. They are mostly littoral, feeding on algæ.

* Umbilicus none.....*1. Littorina.*
* Umbilicus a deep groove.....*2. Lacuna.*

1. Littorina, Fer. The Periwinkles.

Shell top-shaped, thick, pointed, few whorled; aperture rounded, outer lip sharp; columella rather flattened, imperforate; operculum paucispiral.

1. *Littorina ruris*, Don. Shell very variable, heavy to medium, coarse to smooth, subovate, ventricose, with a somewhat pointed spire; whorls convex, covered with more or less distinct, revolving, elevated lines, 10 or 12 on the body whorl, with the intervening spaces finely reticulated. The heavy, coarse shells have the outer lip bevelled within to a sharp edge which is rendered denticulate by the revolving lines. Color yellow, orange, black, brown, green, or reddish, usually uniform, occasionally banded or mottled. Animal with olive-colored head, and an olive line on sides of the foot. L. 14; D. 7–10; An. 60°–70°; Wh. 5–6; Ap. $\frac{1}{2}$. Shell so variable that it has received a score of names.—N. J. and north. Abundant on rocks.

2. *Littorina litorea*, L. Solid, not smooth, yet rarely ridged, but more or less covered with elevated, spiral lines; whorls usually concavely impressed round the upper part; columella broadly callous, slightly arcuated, white. Olive, ash, fulvous, brown, or red, sometimes banded and lined with black; outer lip joining the body at an acute angle, its edge usually dark. Very variable in size, color, and length of spire. Animal with a general dark color above; the sole of the foot yellowish-white. L. 20–25; D. 16–20; An. 80°; Wh. 6–7; Ap. $\frac{1}{2}$.—New England to Delaware Bay.

3. *Littorina palliata*, Say. Shell globular-ovate, thick, smooth and shining, with very faint revolving lines, and lines of growth; last whorl very large, the others scarcely rising above it; suture faintly marked; aperture nearly circular, the outer lip bevelled within to a sharp edge; inner lip broadly flattened and white; color variable, white, yellow, orange, olive, slate, and brown; usually of a single color, often mottled or banded. Animal has the head orange, darker above, and the foot drab or cream-color. L. 15; D. 13; An. 95°; Wh. 4; Ap. $\frac{2}{3}$–$\frac{6}{7}$.—New Jersey and north. Abundant on rocks.

4. *Littorina irrorata*, Say. Shell heavy, with numerous, revolv-

ing, elevated, obtuse, equal ridges, which are spotted with short, brownish lines; whorls flat, suture not indented; outer lip bevelled to a thin edge, and lineated with dark-brownish; inner lip with a lime deposit. Greenish or pale-ashy; throat white—L. 25; D. 15; An. 60°; Wh. 5; Ap. $\frac{2}{5}$.—Mass. and south. Rare north; abundant south.

2. Lacuna, Tur.

Shell turbinated, thin; aperture semilunar; columella flattened with an umbilical fissure; operculum paucispiral.

1. *Lacuna vincta*, Mon. Shell thin, ovate-conic; spire pointed; whorls very convex, with faint lines of growth; suture deep; aperture nearly circular; outer lip sharp, pillar lip white, with a wide and deep groove ending in a deep umbilicus. Color yellowish, with sometimes 4 or 5 purplish or reddish bands. L. 12; D. 8; An. 58°; Wh. 5; Ap. $\frac{1}{2}$.—N. J. and north. Abundant north.

Family 64. RISSOIDÆ.

Shell small, spiral, turreted, usually ribbed, many-worled; aperture rounded with entire lip; outer lip slightly expanded and thickened.

1. Rissoa, Frem.

Shell minute, conical, pointed, many whorled; peristome entire, continuous; outer lip slightly expanded and thickened; operculum subspiral.

1. *Rissoa aculeus*, Gld. Shell ovate-cylindrical, fragile; whorls convex; suture deep; surface covered with numerous, minute, revolving lines, and traces of longitudinal folds near the apex; apex blunt; aperture entire, oval, oblique. Light yellowish horn-color. Animal white. L. 4; D. $1\frac{3}{4}$; An. 23°; Wh. 6. Ap. $\frac{1}{3}$.—New England. On stones and timbers at low water.

2. *Rissoa exarata*, Stim. Shell ovate, rather solid, imperforate; whorls convex, sub-plicate posteriorly, and with about 3 elevated, distant, revolving lines on the upper, and 8 on the lower one. Fuscous. L. 3; D. $1\frac{1}{4}$; An. 22°; Wh. 5; Ap. less than $\frac{1}{3}$.—Nova Scotia to Hatteras. Rare.

3. *Rissoa minuta*, Tot. Shell minute, conic, thin, polished, elevated to an obtuse apex; whorls convex, somewhat shouldered; lines of growth faint; aperture oval, entire; outer lip

sharp; operculum horny, subspiral; yellowish-brown, usually covered by a dark green pigment. Animal dusky-brown and drab; motions very active. L. 4; D. 2; An. 30°; Wh. 5; Ap. $\frac{1}{3}$.—N. J. and north. Common on sea-weeds near shore, and in brackish water.

Family 65. ADEORBIDÆ.

A small family of depressed almost disk-shaped shells.

1. Skenea, Flemg.

Shell minute, depressed, nearly discoidal, few-whorled; peristome entire, round; operculum multispiral.

1. *Skenea planorbis*, Fabr. Shell minute, flat, slightly convex above, broadly concave below, forming a deep umbilicus showing all the whorls; whorls smooth; aperture circular, with a sharp lip; operculum multispiral. Light horn-color. Length of axis $\frac{1}{5}$; D. $1\frac{1}{3}$; An. 130°; Wh. 3; Ap. $\frac{2}{3}$.—New York and north. Common under stones at low water.

Family 66. CALYPTRÆIDÆ.

Shell flat or boat-shaped, with the apex more or less spiral; interior with a shelly process or shelf, variously shaped, to which the adductor muscles are attached. Animal with a distinct head; muzzle lengthened and split, but non-retractile; eyes on the external bases of a pair of tentacles.

The bonnet-limpets adhere to stones and shells; most of them appear never to quit the spot on which they first settle, as the margin of the shells becomes adapted to the surface beneath, while some wear away the space below their foot, and others secrete a shell base.

* Shell conical; partition cup-shaped.....*1. Crucibulum.*
* Shell oblong, flat or convex; partition nearly flat.....*2. Crepidula.*

1. Crucibulum, Schum.

Shell conical, with an internal, cup-shaped plate attached on one side to the wall of the shell.

1. *Crucibulum striatum*, Say. Cup and saucer Limpet. Shell moderately solid, conical with numerous, equidistant, elevated, radiating lines; aperture circular; summit smooth, obtusely pointed, inclined toward the left side and posterior end; internal, cup-shaped partition attached at one side and terminating near the inner apex of the shell. White to waxy-yellow.

Height to apex 12½; D. 20.—New Jersey and north. Common.

2. Crepidula, Lam.

Shell oblong, with an internal plate covering the posterior half.

1. *Crepidula fornicata*, L. (Figs. 41, 42). Shell quite convex, with one side more oblique than the other; surface transversely wrinkled; partition slightly concave, about ½ the size of the oblong aperture. Generally reddish in color. sometimes spotted, occasionally white. L. 25–40; W. 16–30.—Whole extent. Abundant.

2. *Crepidula convexa*, Say. Shell small, opaque, very convex, obliquely-ovate, one side nearly vertical, the other sloping; surface wrinkled; apex acute, separate from the body of the shell, turning to one side and downward to the tip of the shell; aperture oval; diaphragm deep, convex, less than half of the aperture. Color ashen-brown with bands, or spots of reddish-brown. L. 12; W. 8; Height 4. On seaweeds and stones throughout.

3, *Crepidula plana*, Say. Shell flat or reversed concave, ovate to quadrilateral in outline; surface wrinkled. Pure white. L. 28–50; W. 15–30.—Whole extent. Usually within shells.

Family 67. NATICIDÆ.

Shell globular or oval; spire usually short; aperture semilunar, without canal or notch; outer lip sharp; columella lip callous, more or less reflected over the umbilicus.

Animal with small tentacles which are lanceolate, wide apart, united by a veil; eyes absent or minute; mantle enclosed; foot much produced in front, where it is furnished with a fold which covers the head and tentacles; operculum paucispiral, corneous. Marine. Eggs deposited in a curious, sand formed ribbon which is bent in a circular form, constricted into a neck above.

* Aperture less than half the area of the shell.....*1. Natica.*
* Shell ear-shaped; aperture over half the area.....*2. Sigaretus.*

1. Natica, Lam.

Shell sub-globular, spire slightly elevated; aperture half round; a spiral callus on the pillar, entering more or less into the umbilicus. Animal blind, completely retractile within its shell; operculum with an external, limy layer.

* Shell over 20 long. (A.)
A. Umbilicus widely open.. .....*3.*

A. Umbilicus more or less covered with brown callus..... ..... 2.
* Shell under 20 long. (B.)
B. Umbilicus open.....5.
B. Umbilicus more or less covered with white callus. (C.)
C. Under 10 long.....1.
C. Over 10 long.....4.

1. *Natica pusilla*, Say. Shell thin, suboval; callus pressed laterally into the umbilicus, whitish; umbilicus consisting of an arcuated, linear, vertical aperture. Cinereous or rufous, with sometimes, one or two obsolete, revolving bands. L. 6; D. 5; An. 100°; Wh. 3; Ap. $\frac{2}{3}$.—Mass. and south. Not rare.

2. *Natica* (*Neverita*) *duplicata*, Say. (Figs. 31 and 39). Shell solid, subglobose; whorls convexly flattened above; aperture oval, oblique; umbilicus irregular, with a deep furrow, and almost covered by a thick callus. Color ashen-gray, deep chestnut-brown within; callus of the same color. L. 50; D. 50; An. 100°; Wh. 5; Ap. $\frac{3}{5}$.—Mass. and south. Abundant south of Cape Cod.

3. *Natica* (*Lunatia*) *heros*, Say. (Fig. 38, young shell). Shell large, thick, globular ovate; whorls convex; aperture oval, dark reddish-brown, or tinged with yellowish; the callus reflected over a small portion of the larger, patulous, and coarsely wrinkled umbilicus; the young shell is sometimes marked by three revolving series of parallel, oblong, brown spots, 12 or 14 in each row. L. 60; D. 50; An. 120°; Wh. 5; Ap. $\frac{4}{5}$.—Whole extent. Common.

4. *Natica* (*Lunatia*) *Grœnlandica*, Mol. Shell suboval, smooth, glossy, or with faint lines of growth and revolving lines; suture distinct and deep; lip sharp, callus pressed laterally into the umbilicus, leaving a narrow, curved, linear opening. Epidermis ash-colored, bluish-white beneath. L. $12\frac{1}{2}$; D. 11; An. 110°; Wh. 4; Ap. $\frac{2}{3}$.—Mass. and north.

5. *Natica* (*Lunatia*) *immaculata*, Tot. Shell small, solid, suboval; apex short and pointed, suture not impressed; aperture narrow, somewhat acutely curved at base; umbilicus rounded and deep, but little covered by the callus which is not very large, but forms a deposit under the upper part of the lip, and causes a white spiral line to show just below the suture. Epidermis thin, greenish-yellow, milk-white beneath. L. 7; D. $5\frac{1}{2}$; An. 90°; Wh. 5; Ap. $\frac{2}{3}$.—New York and north.

2. Sigaretus, Lam.

Shell ear-shaped, with a minute spire and very large aperture; operculum minute, horny, subspiral.

Animal with a large mantle, partly or entirely covering the shell; anterior foot-lobe, used in burrowing, very large.

1. *Sigaretus perspectivus*, Say. Shell ovate, elongated, depressed; surface with numerous, impressed, slightly undulating lines, crossed by revolving striæ which disappear beneath; aperture more than ¾ the entire area of the shell; suture distinct, but not deep. Milk-white, sometimes tinged with brown; smooth, polished, and faintly iridescent. L. 37; D. 30; An. 140°; Wh. 3; Ap. ¾.

Family 68. ACMÆIDÆ.

Shell wholly external, dish-shaped, with apex directed forward. Animal with eyes, and a plumose, external gill on the neck.

1. Acmæa, Esck.

Shell solid, patelliform. Animal with a frilled muzzle produced at the lower front corners into two tubercles.

1. *Acmæa testudinalis*, Mul. (Fig. 42). Shell oblong, oval, conical, surface finely checkered by the minute, radiating and encircling lines; margin entire, sharp. Whitish or greenish, often mottled with brownish. L. 20–35; W. 12–20; Height 7–12.—New England. On rocks. Common north.

Var. *Alveus*, Con. Shell smaller, oblong, twice as long as wide, with nearly parallel sides.—Same region. On eel-grass.

Family 69. TROCHIDÆ.

Shell usually conical, with flattened base, brilliantly pearly inside; operculum horny, multispiral. Animal with a short muzzle; eyes pedunculated at the outer base of long, slender tentacles; head and sides ornamented with fringed lobes, and tentacular filaments. Feeding on sea-weeds.

1. Margareta, Leach.

Shell usually thin, globular-conical, umbilicated; aperture rounded, pearly; lip sharp, smooth. Many species are found in deep water. The following is in rather shallow water.

1. *Margareta obscura*, Cout. Shell solid, low-conical; whorls convex, and rendered angular near the middle by a prominent, revolving ridge; often one or two additional and less prominent

ridges on the body whorl, with numerous very fine lines; these, with the rather coarse lines of growth, give the surface an indented or cellular appearance; aperture circular; umbilicus large and deep, bounded by a sharp, angular ridge. Dull reddish-brown above, and light ash-color below. L. 10; D. 12; An. 90°; Wh. 5; Ap. $\frac{2}{3}$.—New England. Found in fishes.

Order POLYPLACOPHORA. (The Chitons).

Body vermiform; symmetrical, without separated head or tentacles; ventral surface flattened; dorsal surface covered by calcareous plates, placed in a segmented manner, one behind the other; gills paired.

Family 70. ISCHNOCHITONIDÆ.

Animal furnished with eight, calcareous plates along the back; the head and tail piece similarly articulated; the insertion plates sharp, smooth, fissured; the outer layer around the plates called the *girdle* overhanging the plates and forming *caves*.

* Eaves projecting; girdle covered with minute flattish scales.....
....*1. Trachydermon.*
* Eaves moderate; girdle covered with hairs..... .....*2. Chætopleura.*
* Eaves short; girdle minutely downy..... .....*3. Tonicella.*

Trachydermon, Carpenter.

Anterior and posterior plates with many sharp teeth; girdle covered with minute granular flattish scales, and without pores; eaves projecting, spongy; gills short.

1. *Trachydermon ruber*, Low. Shell small oval, elevated, keeled; lines of growth distinct, but surface unmarked with punctures or granulations, even under the magnifier; color light brick-red or flesh-color; margin coated with red and white dust in alternate blotches; interior bright rose-red. L. 12; W. 7½.—New England. On stones below low water.

2. *Trachydermon albus*, Mont. Shell small, elongated-oval, covered with bluish-black pigment which easily rubs off, and leaves the color yellowish or ashy; valves moderately keeled, and minutely beaked; margin membranous, and covered with beaded granules. L. 10; W. 4.—Cape Cod and north.

2. Chætopleura, Shut.

Anterior and posterior plates with many sharp teeth; surface of girdle hairy; eaves moderate; gills encircling.

1. *Chætopleura apiculata*, Say. (Fig. 44). Form oblong-oval, convex; valves obtusely keeled, the central portion of the posterior margin becoming slightly beaked with age; lateral areas triangular, studded with numerous rounded tubercles, obsolete towards the apices, more numerous towards the sides; these sides are rounded, with an elevated, marginal line; middle space lozenge-shaped, and covered with 10 or 12 rows of elevated, rounded dots on each side of the keel, and parallel with it. Grayish, bluish, or ferruginous. L. 13–25; W. 8–15.—Whole coast. More abundant southerly.

3. Tonicella, Carpenter.

Anterior and posterior plates, as in the preceding; surface of girdle, smooth or minutely downy; eaves short; gills medium.

1. *Tonicella marmoreus*, Fabr. Shell oblong-ovate, rather flat; valves slightly keeled and beaked, their surface covered with microscopic granulations in quincunx order; to the naked eye, smooth and shining; girdle covered with a close, short down, alternately white and red. Color varying from bright red to yellowish or dark brown, with numerous fine, zigzag whitish lines over the whole surface; posterior edge of valves with 6–8 whitish spots. L. 17; W. 11. Cape Cod and north.

CLASS III, CEPHALOPODA.

Free swimming, oceanic mollusks with well-marked head, and a circle of muscular arms around the mouth, by the aid of which they move freely from place to place. These arms are usually supplied with suckers; the eyes are large and very perfect; the mouth provided with two long, beak-like jaws. Sexes distinct.

Order Dibranchiata.

Cephalopoda with two gills in the mantle cavity; eight or ten arms provided with suckers; an ink bag, for the secretion of a black fluid, always present. This is used to color the water when pursued. The species given in this work all belong to the suborder Decapoda having 8 true arms, which are sessile, and 2 long tentacles, which have a stalk and clubbed ends; the suckers are stalked, and have a horny rim. The mantle bears two lateral fins. An internal shell is alway present, and is usually horny in substance, and feather or lance-like in form.

Family 71. SPIRULIDÆ.

This family consists only of the genus :—

1. Spirula, Lam.

Animal with an internal calcareous, spiral shell; the whorls are in the same plane and free from each other, like a watch spring; the shell is divided into many chambers by partitions.

The shells of *Spirula peronii*, Lam. (Figs. 56 and 57), a pelagic species, are occasionally thrown on the shores of Nantucket during a storm, and probably at other places southward. The shell is white, pearly and coiled in 2–3 turns.

Family 72, OMMATOSTREPHIDÆ.

Characters mainly of the genus:—

1. Ommatostrephes, D'Orb.

Body long, cylindrical; arms short, with two rows of suckers; tentacles short, not retractile, the clubs with four rows of suckers; siphons valved, united by bands to the head; shell horny, small, slender, like a lance, with a hollow end cone. Abundant in the open sea and extensively used as bait for cod fish. Commonly called "sea arrows" or "flying squids."

1. *Ommatostrephes illecebrosa*, Lesueur. Head large; body elongate, cylindrial, fleshy, smooth; tentacles short, like the other 8 arms, and provided with 8 rows of numerous small cups; fins rhombic, about $\frac{1}{2}$ as long as the body, sides quite pointed; gladius narrow, ending in a large cone. Whole coast; frequently found near shore.

2. *Ommatostrephes Bartramii*, Lesueur, (Figs. 58, 59). Head short; back with a longitudinal, violet band; tentacles short, with two rows of small cups at the end; second and third pairs of sessile arms with fins on the inner edge of the ventral side; gladius long, slender, with a small cone. Whole coast.

Family 73, ONYCHOTEUTHIDÆ.

The principal peculiarity of this family is the development of hooks upon the arms in the place of more or less of the sucking disks.

1. Onychoteuthis, Lichtenstein.

Arms with two rows of suckers, the rings of which are not toothed; tentacles thick, their clubs with two rows of strong hooks, and at the base a rounded group of suckers; gladius lancet-form with an end cone.

1. *Onychoteuthis Banksii*, Leach. (Figs. 60, 61). Head with

11 longitudinal ridges; fins rhomboidal, wider than long, about half the length of the body; tentacles with a double series of hooks as well as cups, 20–22 in number; gladius slender with an obconic end. Pelagic, whole coast, abundant.

Family 74. CRANCHIIDÆ.

Represented only by the genus:—

1. Loligopsis, Lam.

Body long, attenuated behind; siphons not valved; tentacles long and slender.

1. *Loligopsis pavo*, Lesueur. (Figs. 62, 63). Body very long, conical, attenuated; fins terminal, about ⅓ the length of the body, rounded in outline, soft in substance; gladius very slender, nearly gelatinous. Coast south of N. J.

Family 75. SEPIOLIDÆ.

Body short; tentacular arms completely retractile; fins short, in the middle of the sides of the back; gladius only about ½ as long as the body, sometimes absent.

1. Sepiola, Leach.

Body short, purse-like; fins dorsal, rounded, narrow at the base.

1. *Sepiola atlantica*, Orb. et F. (Fig. 64). Sessile arms short, unequal; fins short, oval, far apart, in the middle of the back; gladius horny, linear, narrow, ending in a spatulate tip, about ½ as long as the body.—Whole coast.

Family 76. LOLIGINIDÆ.

Represented only by the genus:—

Loligo, Lam.

Body long, and with fins on the sides of the tail extending to the tip; the shaft of the gladius is keeled on the ventral sides, and is as long as the back; cups of the 8 short arms in two rows.

* Fins less than ½ the length of the body.....*1.*
* Fins more than ½ the length of the body.....*2, 3.*

1. *Loligo brevis*, Blainv. Body cylindrical, obtuse at posterior end; fins short, transversely oval; gladius dilated, very broad, narrow in front.—Del. Bay and south.

2. *Loligo Pealii*, Lesueur. (Figs. 65, 66). Body subconical, acuminated posteriorly; fins rhomboidal, thick, occupying

more than $\frac{1}{2}$ the length of the body; side angles rounded; gladius lanceolate, narrow; cups very oblique, in two regular rows. Dark colored and much spotted.—Common along the whole coast.

3. *Loligo pallida*, Ver. Body stout, tapering rapidly backward; candal fin large, about as broad as long, more than $\frac{1}{2}$ the length of the body, side angles hardly at all rounded; tentacular arms about as long as the body when extended. General color pale, gelatinous, translucent, not very thickly covered with spots. Length from base of arms 145; body 120; fins L. 70, W. 75. Conn. and N. Y.

GLOSSARY OF MOLLUSCAN TERMS.

A

Acute, sharp, as the outer lip of many univalves.

Adductor muscle, in bivalves, the one or two muscles used to hold the valves together; *adductor impressions*, the scars in the shell showing where the muscles were attached.

Amphibious, inhabiting both land and water.

Anterior, in bivalves, the end of the shell having the foot and mouth of the animal (Fig. 15, A.); in univalves, the end opposite the apex of the spire of the shell (Fig. 35, A).

Aperture, an opening; of univalves, the mouth of the shell (Fig. 32, K).

Apex, the extreme point of the spire of a univalve (Fig. 32, B).

Approximate, very near together, as the umbones of some bivalves.

Aquatic, inhabiting the water.

Arborescent, tree-like; branching like a tree, as the gills of some sea slugs (Fig. 30, G).

Arched, bowed, or rounded.

Arcuate, in the form of an arch.

Area of shell, the space included in the outline of the shell as drawn; the aperture is more or less in ratio to the whole. Fig. 54 shows aperture more than two-thirds the area.

Attenuate, long and slender, or ending in a long point.

B

Basal, bottom; when used in univalves, it means the anterior end of the aperture (Fig. 35, A).

Beaks, often used in mulluscan works under bivalves and equivalent to umbones or umbo (which see). Fig. 5, E).

Bivalve, applied to shells with two movable plates forming sides; as the mussel. Plate I.

Boreal, northern.

Brackish, applied to water having a little salt, as the mouths of streams flowing into the ocean.

Branchia, a gill or breathing organ of water animals.

Buccinifform, shaped like buccinum (Fig. 34).

Bulbous, swollen or globular.

Byssiferous, fastened by byssus, as the salt-water mussels.

Byssus, thread-like strands which are used to fasten some bivalves.

C

Calcareous, lime-like or formed of lime.

Callous, hardened, or covered with a special deposit.

Callus, special deposit of shell material often found near the aperture of univalves (Fig. 39, E).

Calyculate, having a cup-like umbo, which is divided from the rest of the shell by a distinct mark.

Campanulate, in the form of a bell.

Canal, a grove or channel, usually applied to the anterior prolongation of univalve shells (Fig. 37).

Cancellated, cross-barred; meshed with lines crossing each other and forming a lattice-like appearance (Fig. 45).

Cardinal teeth, the transverse teeth of bivalve shells; found near the umbones (Figs. 3 and 7, C).

Carinate, with a keel or ridge.

Cartilage, the internal rubber-like substance which opens the valves of a shell.

Caudal, having a tail-like appendage.

Cimeter, having a shape like a sword.

Cinereous, having the color of wood ashes.

Cirrated, with movable hairs, as the siphons of many bivalves; they are prehensile or grasping organs.

Cirriferous, the same as cirrated.

Clavate, club shaped.

Closed, applied to bivalve shells which shut tightly all around the edge (Fig. 6).

Compressed, applied to bivalves when the valves are quite flat.

Concave, hollowed out.

Concentric, from the same centre; applied to the lines or grooves on bivalves which are parallel with each other, and form arcs with the umbo as a centre (Fig. 5).

Columella, a small column; the term used in univalve shells for the axis around which the whorls are formed

Conic or Conical, cone shaped (Fig. 32).
Constricted, with a narrow part.
Contractile, capable of being much contracted.
Convex, bulging or rounded outward.
Cordate, heart-shaped.
Coriaceous, leather-like, or tough like leather.
Corneous, horn-like, or consisting of horny substance.
Corroded, eaten off, as the epidermis of many shells.
Corrugations, wrinkles or ridges.
Costate, having ribs or rib-like ridges (Fig. 35).
Crenated, having the edges formed of many little rounded lobes (Fig. 7).
Crepuscular, coming out in the evening.
Crescentic, having a form like the crescent moon.

D

Dead shells, those in which the animal died before the shell was gathered.
Deciduous, coming off soon, as the epidermis of shells which peel off.
Decollated, having the end cut short off, or truncated.
Decussated, intersected with cross lines.
Deflected, bent downward, as the last whorl of some univalves.
Dentate, having the edge formed of many sharp points.
Denticulate, minutely dentate.
Denuded, made bare, or worn off.
Depressed, flattened, as when the spire is flat or nearly so.
Dextral, right handed; applied to shells which, when held so that the spire is upward and the aperture towards the person, the aperture is on the right hand side (Fig. 38).
Diaphanous, somewhat transparent, or at least translucent.
Discoidal, having the shape of a flattened disc.
Dorsal, pertaining to the back; in bivalves, it is the hinge edge.

E

Eared, with projecting wing-like parts at the sides of the umbones, as in Fig. 4.
Eaves, the projecting edges of the girdle over the valves in chitons.
Effuse, having the lips separated by a groove.
Elliptical, having an oval or elliptical form.
Emarginate, obtusely notched.
Entire, the edge even; no notches of any kind.
Epidermis, the skin or membrane covering most shells.
Epiphragm, the membrane formed of mucus, which closes the aperture of many land shells during the winter.
Equilateral, in bivalve shells, when the umbo is about central (Fig. 4).
Equivalve, in bivalve shells, when the valves are of equal size and bulge alike (Fig. 6).
Eroded, worn off.
Estuary, the mouth of a river where the tide meets the current.
Everted, turned more or less inside out, or widely spreading.
Expanding, widely spreading or trumpet-shaped, as the aperture of some shells.

F

Filamentous, slender, thread like.
Fissure, a notch.
Flat, used with reference to the peristome when straight.
Fluviatile, inhabiting flowing streams.
Fragile, easily broken.
Free, not fixed or fastened.
Fusiform, spindle-shaped; thick in the centre and tapering both ways (Fig. 48).

G

Gaping, applied to bivalve shells which do not fit closely when closed (Fig. 10).
Gelatinous, jelly like.
Gibbous, rounded outward like the gibbous moon.
Gills, breathing organs of water animals; often external in the sea slugs (Figs. 28–31).
Girdle, the leather-like border of chitons (Fig. 44).
Gladius, the horny quill-pen like part found in the bodies of squids (Fig. 65).
Globose, rounded or globular.
Glutinous, sticky, slimy or gummy.
Gonial ridge, the ridge often found in bivalve shells extending from the umbo to the gonium. Fig. 11, dotted line A C, shows position of gonial ridge.

Gonium, the lower back angle of bivalve shells (Fig. 11, C).
Granular, small grain-like markings.
Granulose, covered with small markings like grains (Fig. 55).
Gregarious, living together in flocks.

H

Habitat, locality where found.
Herbivorous, living on plants.
Hermaphrodite, both sexes united in one individual.
Hispid, covered with rather stiff hairs (Fig. 3).
Hyaline, glassy.

I

Imbricating, over-lapping, as the shingles of a roof.
Impressed, marked with a plain furrow, as the suture of the spire (Fig. 32, H).
Incrassated, thickened, coarse.
Incumbent, resting against, or bent against.
Incurved, bent over.
Indented, cut or notched.
Inequivalve, applied to bivalves when one valve is larger or bulges more than the other (Fig. 1).
Inflated, swollen, as bivalve shells when the width is great.
Inflected, turned in, as the lips of the aperture
Invaginate, the bending of one part into another.
Involute, one part curved around another.

K

Keeled, with a ridge-like projection.

L

Labium, the inner lip of the aperture, the one next the axis (Fig. 32, J).
Labrum, the outer lip of the aperture (Fig. 32, C).
Lamellated, covered with scales or plates (Fig. 15).
Lamellibranchiate, having leaf-like gills.
Lamelliform, having the form of plates or scales.
Laminæ, thin, leaf-like layers.
Lateral teeth, the elongated teeth of the hinge of bivalves farthest from the umbo (Fig. 8, D. and E).
Lens-shape or Lenticular, applied to univalves which are disk-like, but curve outward about the same on each side, like a double-convex lens.
Ligament, the name of the external, rubber-like substance which tends to open the valves of shells (Fig. 6, D).
Limpet-shaped, flattened, cup-shaped (Figs. 42 and 43)
Littoral, that part of the shore between high and low water.
Live shells, shells which were gathered while the animal was alive; after cleaning they are always called by this term to indicate that they are more perfect in color and parts.
Livid, of a blackish blue color.
Locomotive, applied to shells which walk around on the surface of things, instead of burrowing or remaining fixed.
Lunate, of a shape nearly like that of the half moon.
Lunule, a mark or indented spot, often moon-shaped, found in front of the umbones of some bivalves (Fig. 6, C).

M

Mantle, the outer, soft membrane of the body of a mollusk, usually lining the shell and fastened to it at a short distance from the outer margin; in bivalves. it is attached along the pallial line.
Marine, pertaining or belonging to the sea.
Microscopic, very fine and needing a magnifying glass to be seen distinctly.
Mucous, the part secreting mucus.
Mucus, the slimy secretion of land snails.
Muricated, armed with sharp points or prickles.

N

Nacreous, iridescent, pearly.
Natatory, enabling to swim.
Nodulous, having small knots or irregular prominences.
Nucleus, the beginning of a shell; in univalves the apex, and in bivalves. umbones.

O

Obconic, a reversed cone.
Obelisk-shaped, a very elongated cone with the apex removed.
Oblique, slanting; applied to the aperture when its length is not parallel with the axis of the shell.
Obovate, a reversed ovate; univalve shells which have their widest part nearer the apex than the anterior end.
Obsoletely, applied to markings which are very hard to see.
Ocelli, the minute, simple eyes found in pectens and a few other genera of bivalves.
Ochreous, a dull, yellowish orange color.
Opaque, not at all transparent or translucent.
Operculum, the hard cover or lid on on the foot of many univalves and closing the aperture when the animal draws into the shell (Fig. 45, A).
Oral, pertaining to the mouth; applied to the tentacles nearest to the mouth (Fig. 27, A).
Orbicular, applied to shells which are rounded and flattened, like a disk, the spire being very low.
Orifice, opening.
Ovate, egg-shaped.
Ovately conic, egg-shaped, but ending in more or less of a conic point (Fig. 38).

P

Pallets, the small spade-shaped shells at the end of siphons of the shipworms (Teredo, etc.,) (Fig. 19).
Palliel line or impression, the mark extending between the adductor muscles of bivalves, showing the attachment of the mantle to the shell (Fig. 7, H).
Palpi, the feelers or tentacles of mollusks (Fig. 28, A and B).
Papillæ, small projecting points or pimples.
Papilose, covered with pimples or warts.
Parietal, pertaining to or growing from the inner wall or shell.
Patelliform, the shape of a depressed cone (Fig. 42).
Patulous, open, expanded, slightly spreading.
Paucispiral, slightly spiral; applied to operculæ (Fig. 49).
Pedicel, a foot-stalk or stem.
Pelagic, pertaining to the sea; applied to mollusks of the open sea, as to the squids and pteropods.
Pellucid, transparent, clear, bright.
Penultimate, next before the last.
Perfoliate, having a stem passing through.
Periphery, the outside line of a form.
Peristome, the edge around the aperture.
Peritreme, the rim or extreme edge of the aperture of univalves.
Pestle-shaped, the shape of the pulverizing instrument used in a mortar by druggists.
Pervious, slightly open, as the umbilicus when small.
Pilose, covered with distinct hairs.
Pinnate, with branching divisions arranged like a feather, as the gills of many univalves (Fig. 28, G).
Plaits, folds like the bottom of some dresses (Fig. 3).
Planorboid, applied to disk-like shells with a flat spire like planorbis.
Plicate, folded back and forth like a fan.
Podial ridge, the ridge often found in bivalve shells extending from the umbo to the podium. Fig. 11, dotted line A B, shows the position of the podial ridge.
Podium, the lower front angle of bivalve shells (Fig. 11, B).

R

Radiated, extending off from a point in many directions, as the rays of light from a luminous body; the ridges of Fig. 4.
Radula, the chitinous ribbon bearing the teeth of mollusks; called also lingual ribbon and tongue; lingual ribbon covered with teeth, also called tongue (Fig. 31).
Ramose, having many branches, as a stem with many divisions.
Reflected, reflexed; turned or bent backward.
Reticulated, resembling net-work; having lines crossing each other like a net (Fig. 36).
Retractile, capable of being drawn back or turned inward, as the tentacles of land snails.

Revolving lines, lines on a univalve shell parallel with the whorls and suture (Fig. 34).
Rhombic, having four equal sides and oblique angles.
Rhomboid, a figure of four sides, the opposite sides equal and parallel, but two of the sides longer than the other two.
Ribbed, with raised parallel ridges or lines.
Rimate, with a slight crack or chink, as the umbilicus of univalves when not fully open.
Rostrated, having a rostrum or beak with the mouth at the end.
Rostrum, the proboscis of univalves with the mouth at the extremity.
Rotund, rounded or spherical.
Rubiginose, with a rough surface.
Rufous, of a brownish red color.
Rugose, rough with wrinkles.

S

Series, a number of marks arranged in regular order.
Serrated, notched at the edge like a saw.
Sessile, without a stem.
Setaceous, having the slender form of a bristle or covered with bristles.
Shouldered, having a projecting ridge, as the whorls of many univalves (Figs. 36 and 37).
Simple, without break or notch, as the peristome when continuing all around; and the pallial line when without notch or sinus (Fig. 3, H).
Sinistral, left-handed, as the shells of univalves which, when held so that the apex is upward and the aperture towards the person, the aperture is on the left (Figs. 21 and 55).
Sinuous, having the edge alternately curved inward and outward (Fig. 15, A).
Sinus, the notch in the pallial line of many bivalves, showing the position of the siphon (Figs. 7 and 9, I).
Siphon, the one or two tubes of mollusks through which the water flows to supply the animal with oxygen, and, in bivalves, with food also (Fig. 11, D, and Fig. 45, D).
Solid, applied to shells which are thick and strong.
Spatulate, of the form of a spatula used by druggists to pulverize substances.
Spiculose, covered with sharp, hard points.
Spiral, winding around, as the whorls of the spire of most univalves.
Striæ, minute lines, but visible to the unaided eye.
Striate, covered with striæ, usually lines of growth.
Subulate, narrow and tapering to a sharp point; awl-shaped.
Sulcate, marked with furrows or deep grooves.
Sulcus, a deep groove.
Superficial, just on the surface.
Superior angle, the upper angle.
Suture, the groove between the whorls of the spire of univalves (Fig. 32, H).

T

Teeth, in bivalves the term is used for the cardinal teeth of the hinge (Fig. 3, C).
Tentacles, the projecting feeler-like parts on the heads of snails (Fig. 45, C); and the long arms of squids (Fig. 66).
Terete, cylindrical, but tapering like a twig of a tree.
Testaceous, shell like.
Toothed hinge, a hinge with cardinal teeth, as most bivalves.
Translucent, nearly but not quite transparent.
Transverse, when elongated in a direction not usual, as when the aperture is wider than long; also applied to cardinal teeth when they are longer in the direction of the length of the shell.
Trapezoidal, having four sides but the opposite sides not parallel.
Trilobate, with three rounded lobes
Truncated, having the end not rounded but square as though cut off.
Tuberculate, covered with projecting, rounded points (Fig. 36).
Tuberculiform, having the form of a tuber, like the white potato.
Tubercles, rounded points or pimples.
Tumid, swollen.
Turbinate, shaped like a top.
Turreted, shaped like a tower (Fig. 55).
Turriculate, with the form of a tower.

U

Umbilicus, a depression or opening in the centre of the base of many univalve shells (Fig. 38, A).

Umbone, the nuclei or starting points of bivalve shells (Fig. 5, E).

V

Valves, the two shells which enclose bivalve mollusks.
Varices, longitudinal ribs of univalve shells (Fig. 35).
Varicose, unusually enlarged or swollen.
Ventral, the lower side; applied to the edge of bivalve shells farthest from the hinge (Fig. 5, D).
Ventricose, inflated, swollen or rounded on the ventral side.
Vesicular, having many bladdery cavities.
Viscera, the internal organs, including stomach, etc.
Vitta, a band or stripe of color.
Volutions, the whorls of univalve shells.

W

Warped, twisted irregularly (Fig. 1).
Whorls, the spiral convolutions of a shell (Fig. 32, G).
Wings, thin compressed portions near the umbones, found in some of the fresh water mussels.

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Errata: Vol. II., No. 1, Jan. 1889.

Page 36, line 6 from top, omit "Leaves not prickly."

Page 48, line 17 from top, omit the comma.

Page 55, line 9 from top, insert the word "petioled" between "not" and "cordate."

Page 56, line 2 from top, for "not cordate nor petioled," read "not cordate and petioled."

Figure 1. Anomia simplex, oblique view; A, the very convex upper valve; B, the lower valve; C, the circular hole for a plug which is used to fasten the shell.

2. Mytilis edulus; the whole exterior surface of the left valve showing the distinct concentric lines of growth: the interior makings and teeth of the anterior end of the right valve are also shown.

3. Arca pexata; H, the entire (*i. e.*, without sinus), pallial line; C, the numerous, transverse, or cardinal teeth of the hinge.

4. Pecten irradians; surface covered with radiating ribs; A and B, the ears making the hinge line straight.

5. Venus mercenaria, left valve; A, anterior end; B, posterior end; C, dorsal side; D, ventral side; E, umbo; distance A B, the length of the shell; C D, the height of shell; ratio A G to A B, the position of umbo, in this case, $\frac{1}{6}$. Fig. 6, anterior view; A B, the width of the shell; D, external ligament; C, lunule in front of the umbones. Fig. 7, interior view of the right valve; C, cardinal teeth; D, lateral teeth; E, anterior adductor muscle impression; G, posterior adductor muscle impression; H, pallial line; I, sinus of the pallial line; the ventral edge is crenulated.

8. Mactra solidissima, interior view of right valve; G, spoon-shaped cavity for an internal cartilage; D and E, striated lateral teeth; B A C, angle of the slopes of the shell.

9. Mya arenaria, oblique interior view of the left valve to show the projecting cartilage process C; I, the very deep and large sinus of the pallial line H. Fig. 10, dorsal view to show the wide gaping of the ends while the ventral edge is closed. Fig. 11, the expanded animal parts: D, the united siphons at the posterior end; E, the incurrent orifice; F, the excurrent orifice; G, the foot at the anterior end. B, marks the position of the shell border called the podium, and C, the position, often angulated, called the gonium. The portion A B, in many shells has either ridges or grooves; such ridges or grooves are called podial ones; ridges or grooves along the line A C are called gonial ones. These terms are quite useful in the descriptions of Unios and many other bivalve shells.

12. Donax fossor; external view of left valve and the extended animal parts. This shell is peculiar in having the ligament on the shorter end of the shell; the longer end being the anterior or foot end. The siphons are here short and divided. Fig. 13, dorsal view, showing the closed ends and the short external ligament. Fig. 14, internal view of the right valve.

15. Petricola pholadiformis; oblique view to show the united mantle below. The siphons are long and separated except at the base; the incurrent orifice E is fringed.

16. Pholas costata; anterior end, showing the reflected hinge plates at A, and the widely gaping ends. Fig. 17, dorsal view, showing the two extra valves at D, one in front of the other, over the reflexed hinge plates; A, anterior end; B, posterior end.

18. Teredo navalis, showing the animal parts all extended. Fig. 19, the pallets of the posterior or siphon end. Fig. 20, the left valve; the right is shown on Fig. 18, just below.

Figures 1 to 3, 5 to 7, and 9 to 11, are about half scale; figs. 4, 8, 16, and 17 are about a third or fourth scale; figs. 12 to 14, and 18 to 20, are about natural size.

Figure 18 is adapted from A. E. Verrill in Sea Fisheries, and 19 and 20 are taken from Binney Gould's Invertebrates of Mass. The rest are original.

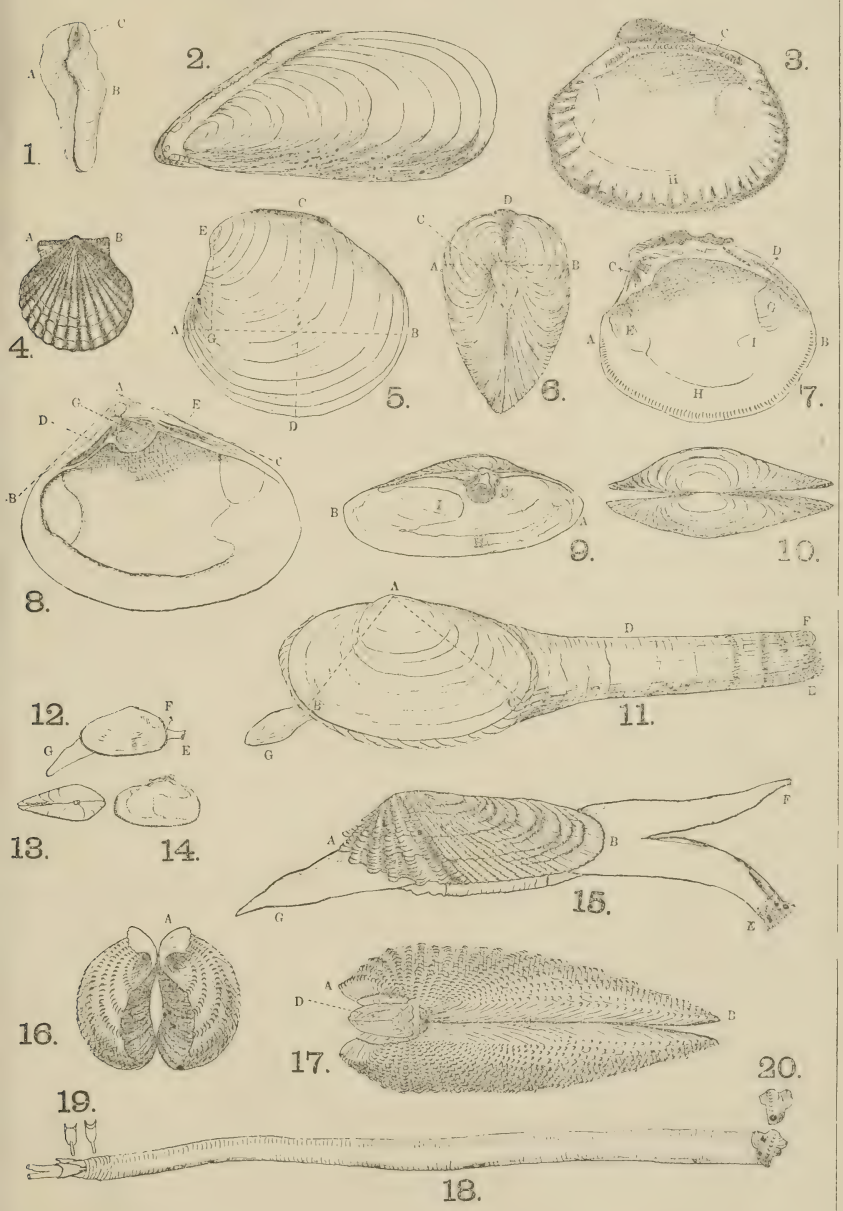
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Figure 21. Limacina retroversa, the spiral, sinistral shell.

22. Cavolina tridentata; an expanded animal with wing-like swimming organs and the projections from the mantle extending out from the side slits of the shell. Fig. 23, the shell.

24. Creseis conica; an expanded animal with the tentacles projecting from the wings. Fig. 25, the slender conical shell.

26. Elysia catulus, the animal with the swimming organs folded over the back.

27. Eolidia pilata; A, the oral tentacles; B, the dorsal tentacles; G, the external gills in five series. The front angles of the foot can be seen between the tentacles.

28. Doris tuberculata; G, a circle of pinnate, retractile gills. The laminated, dorsal tentacles are also retractile into cavities.

29. Dendronotus arborescens; A, antler-like appendages; B, dorsal tentacles; G, the arborescent gills.

30. Polycera Lessonii; G, the bipinnate, non-retractile gills forming but a half circle.

31. Natica duplicata, the radula or lingual ribbon (also called tongue). All the animals on this plate have some form of radula.

32. Sipho Stimpsoni; a dextral, spiral shell, illustrating various terms used in the descriptions; A, the anterior end; B, the posterior end, the apex of the spire and the nucleus; G, the whorls of the spire; H, the suture; I, the body whorl; E B F, the angle of the spire; K, the aperture; J, the inner lip and the columella; L, an anterior canal; C, the outer lip; the distance A B, the length of the shell; D C, the diameter or width. The aperture is half the length of the shell; the whorls are eight in number. Fig. 33, the operculum.

34. Purpura lapillus; the revolving furrows and ridges are very district; the aperture has a notch instead of a canal at the anterior end.

35. Urosalpinx cinerea; the rib-like undulations or varices are more distinct than the revolving lines; whorls rounded; suture deep; canal, short.

36. Nassa trivittata; the whorls flattened and shouldered at the suture; surface granulated; the revolving lines and the ribs about equally prominent.

37. Eupleura caudata; the whorls angulated; the varices or ribs stout; the canal long, straight and narrow.

38 Natica heros; a young shell with the three revolving series of blotches; A, open umbilicus.

39. Natica duplicata, with the umbilicus nearly covered with a callus at B.

40. Crepidula fornicata; side view showing the apex and lines of growth.

41. The same, under side, with the shelf in the boat-shaped shell.

42. Acmæa testudinalis; side view of the conical shell. Fig. 43, interior view.

44. Chætopleura apiculata; shell composed of eight arched pieces surrounded by a leather-like material forming a girdle.

45. Nassa obsoleta; A, the operculum; B, the foot; C, the tentacles with eyes at their outer bases; D, the siphon. The shell is reticulated.

46. Melampus lineatus, under side; the foot with a transverse groove; the head showing the mouth on the under side. Fig. 47, side view; the head has one pair of tentacles with eyes at their inner bases. Fig. 48, the shell; the inner lip with two fold-like teeth.

49, 50, 51, 52 and 33 show different varieties of opercula. 49 is paucispiral, 50 spiral, 51 imbricated with a marginal nucleus, 52 concentric, and 33 somewhat spiral with an apical nucleus.

53. Haminea solitaria; aperture more than half the area of the shell; a pit in place of spire; aperture full length of the shell.

54. Philine sinuata; aperture three-fourths the area; spire rudimentary.

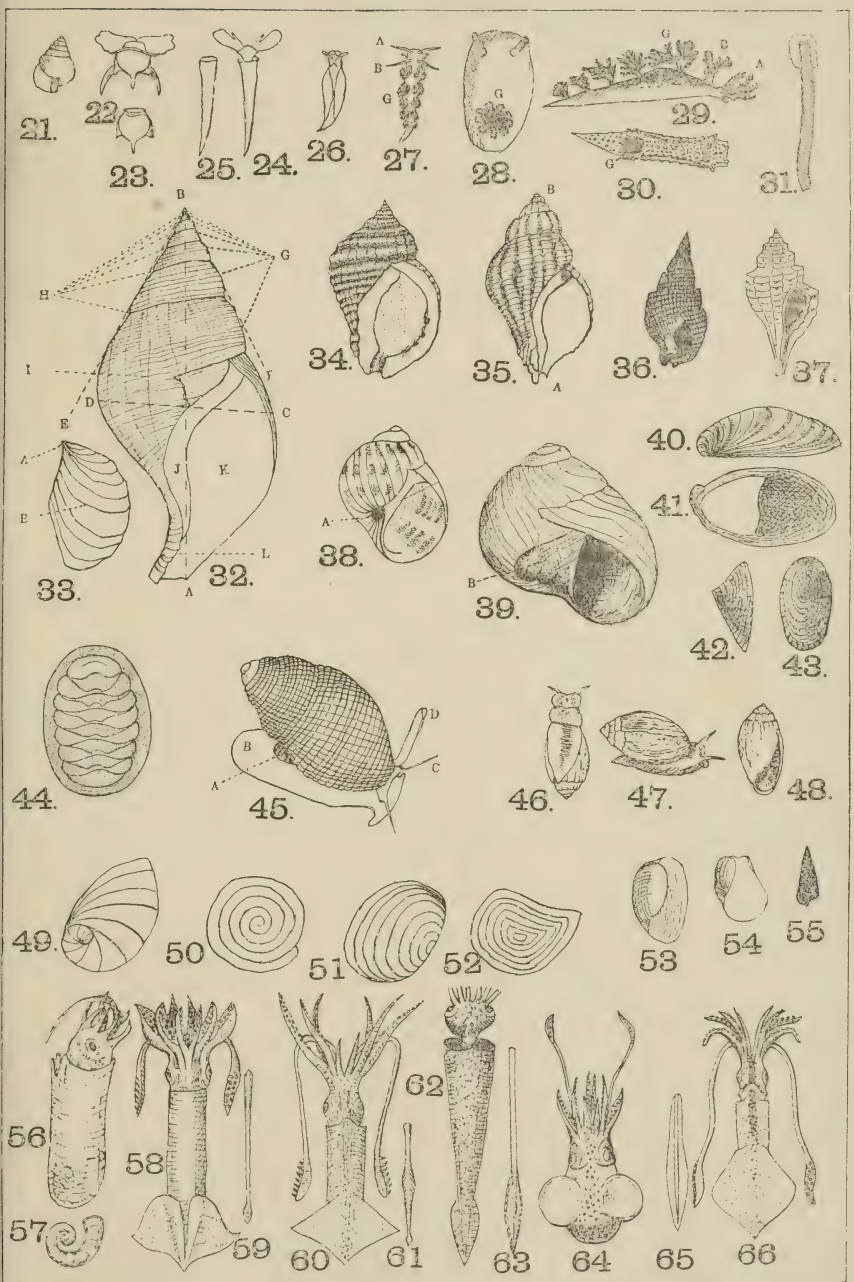
55. Triforis perversa; a sinistral, turreted shell; aperture very short.

56. Spirula Peronii. Fig. 57, the spiral chambered shell with the whorls separated. Fig. 58, Ommatostrephes Bartramii; 59, the gladius. Fig. 60, Onychoteuthis Banksii; 61, the gladius. Fig. 62, Loligopsis pavo; 63, the gladius. Fig. 64, Sepiola atlantica; 65, the gladius. Fig. 66, Loligo Pealii.

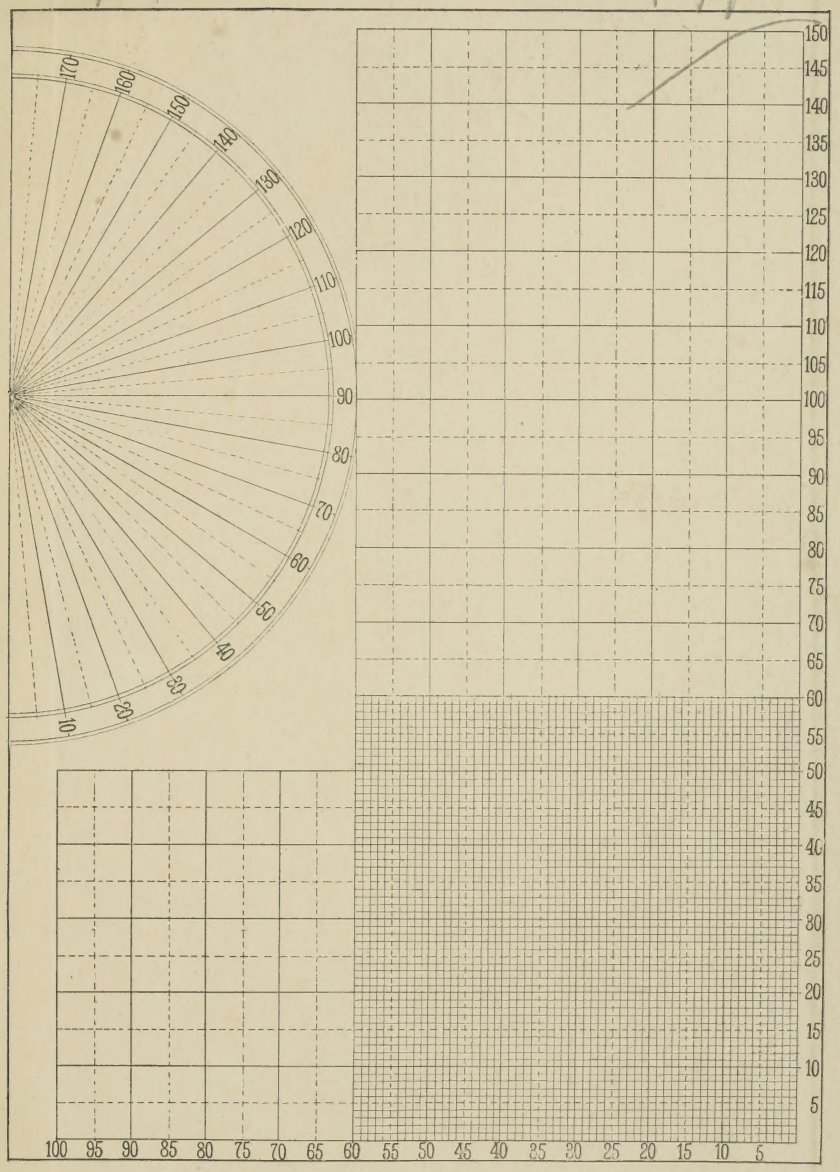
In Figs. 56–66, there are eight true arms, which are sessile, besides which there are two peculiar ones called tentacles. The side projections, usually near the tail, are called fins.

Figures 24, 25, 30, 32 to 38, 44 to 48 and 55, are about natural size; 22, 23, 28, 29, and 39 to 43, about half size; 27, one-third size; 26, 31 and 53, are double size; 21 and 54, are much enlarged (x 5); 56 to 66, are much reduced.

Figures 21 to 30, and 53 to 55, are after figures in Binney Gould's Inv. of Mass.; 56–66, from Tryon's Am. Marine Conch. The others are original.



FIGS. 21–55 *Gastropoda*, FIGS. 56–66 *Cephalopoda*.



PROTRACTOR AND MILLIMETER SCALE.

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